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Handbook to Winnipeg

AND THE

Province of Manitoba

PREPARED FOR THE 79TH ANNUAL MEETING
OF THE

British Association

FOR THE

Advancement of Science

1909

WITH NOTES ON SOME OF THE CHIEF POINTS
TO BE VISITED ON THE WESTERN
EXCURSION

EDITED BY THE LOCAL SECRETARIES

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WINNIPEG

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CONTENTS

Sketch of the History of the City of Winnipeg and of the Four Provinces of Western Canada—by the Rev. George Bryce, D.D., L.L.D.....	7
The City of Winnipeg—by C. F. Roland, Esq.....	26
The Industries of Manitoba—by C. F. Roland, Esq.....	57
Agriculture in Manitoba—by the Hon. R. P. Roblin and Principal W. J. Black, B.S.A., with the assistance of various contributors.....	64
The Geology of Canada—by R. W. Brock, Esq.....	104
The Climate of Manitoba—by R. F. Stupart, Esq....	149
Flora of Manitoba—by the late Rev. Canon Burman, M. A., and Professor A. H. R. Buller, D. Sc., Ph.D.	156
Fauna of Manitoba—by Ernest Thompson Seton, Esq.	183
The Fish and Fisheries of Manitoba—by Professor Edward E. Prince	228
The Indians of Western Canada—by the Hon. David Laird	238
The Game Fields of the West—by P. J. Turner, Esq.	253
Transportation in Canada—by Geo. H. Ham, Esq..	268
Notes on some of the chief points to be visited on the Western Excursion	285
Maps, in cover, prepared by James White, Esq., F.R.G.S.	

PREFATORY NOTE

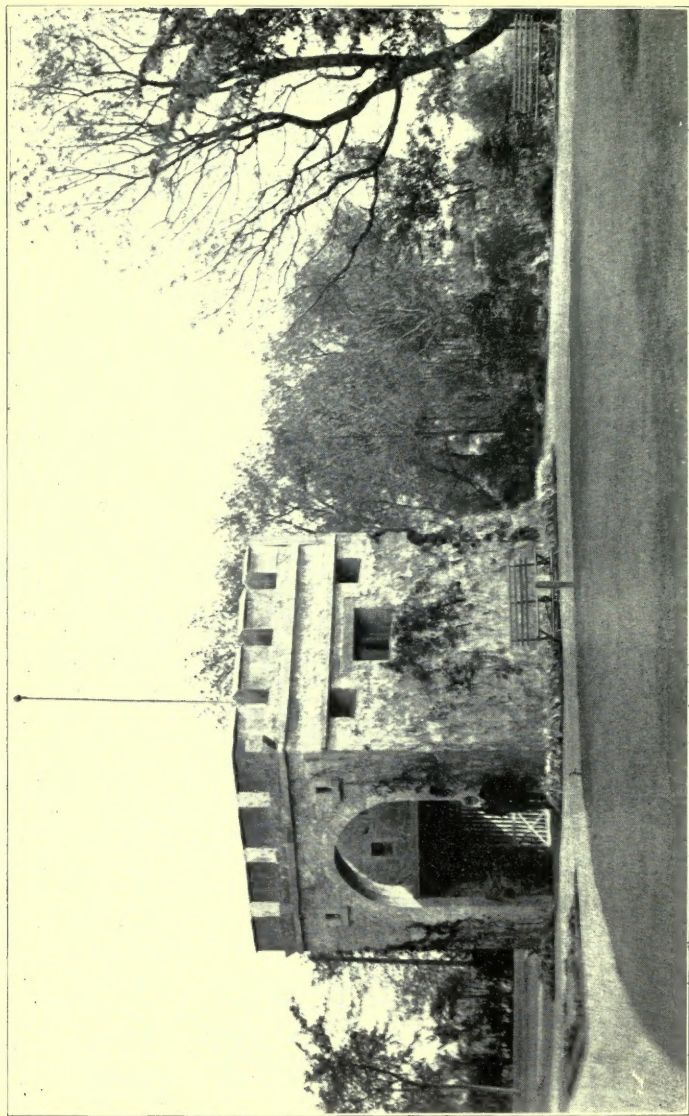
The Publication Committee of the Local Executive, desire to express their indebtedness to the authors of the articles contained in this Handbook, for their hearty and gratuitous co-operation in the preparation of the volume. All the contributors can lay claim to special knowledge of the subjects upon which they have written.

The Committee desire also to record their gratitude to Mr. James White, Chief Geographer, Ottawa, for the trouble he has taken in arranging for the preparation of the maps and charts included in the Handbook. They wish further to express their indebtedness to the Minister of the Interior for having generously presented these to the Committee.

It is hoped that this volume will be not only of interest to the visiting members of the British Association, but also of some permanent value.

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Editorial Committee.



Fort Garry Gateway, Winnipeg

SKETCH OF THE HISTORY OF THE CITY OF WINNIPEG AND OF THE FOUR PROVINCES OF WESTERN CANADA

By The REV. GEORGE BRYCE, D.D., L.L.D.,

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AROUND the pageant enacted at Sault Ste. Marie by Sieur de St. Lusson in 1670 gathered the interest of the French nation in the Canadian West, when, in the name of Louis XIV., the Commissioner took possession of "Sainte Marie de Saut," as also of Lakes Huron and Superior, the island of Manitoulin, and all countries, rivers, lakes and streams contiguous and adjacent there unto. A cedar cross was raised, and upon it the royal arm of France were fixed. Seventeen Indian tribes were invited to the spectacle, even the far distant Crees and Assiniboines. None of these tribes disputed the French claim.

In the same year Charles II, King of Great Britain and Ireland, gave to the Hudson's Bay Company "all the lands, countries and territories upon the coasts and confines of the seas, streights, bays, lakes, rivers, creeks and sounds lying within the entrance of the streights commonly called Hudson's streights," with one limitation, viz., except those "which are not now actually possessed by any of our subjects, or by the subjects of any other Christian prince or state." Here then came in the French claim that their occupation of the Canadian West was first, and here, in after days, arose the claim of Canada for the territory held by the Hudson's Bay Company.

From 1762, shortly after the conquest of Canada, the Fur Traders of Montreal began to extend their trade

and build forts throughout the wide region from Lake Superior and Lake of the Woods westward to the distant Saskatchewan.

In 1772 the Hudson's Bay Company left the shore of the Bay, which it had tenaciously hugged for a century, and erected in the Saskatchewan district its first inland post at Cumberland House, within a few hundreds of yards of Sturgeon Lake Fort, which Joseph Frobisher, one of the Canadian traders, had built. From this time forward the conflict of the Companies continued, until, when once a fort of the one Company was established, soon beside it appeared a fort of the other. At one time, about the year 1800, an offshoot of the North-West Company of Montreal added a third fort at all the chief points of competition through the Western country, while there were also a few independent or "free" traders who joined in the fray. Competition led to waste, and ruin stared all in the face.

The North-West Company of Montreal was chiefly led by a number of vigorous Scottish merchants, who after the capture of Quebec had remained behind from Amherst's army or had been drawn over from the American colonies to Montreal. They became the "Lords of the North." Their voyageurs and servants were chiefly French Canadians. Through the intermarriages of both the leaders and the laborers, with the Indian women in the West, by the end of the century there had grown up a stalwart race of Bois-brulés, Metis, or Half-breeds, as they were called. Among these occur the names of Grant, McKenzie, Sinclair, McGillivray, McLeod and Fraser, as well as of Sayer, Nolin, Falcon, Delorme, Lepine, Goulet and many others.

Bound together by the common bond of Indian blood, they began to feel their power in the country, and called themselves "The New Nation." The employees of the Hudson's Bay Company were largely of Orkney origin,

and the children of their Indian wives were known as English-speaking or English-half-breeds.

About the year 1800 the competition of the fur traders became so fierce that the strife at times reached the point of bloodshed, and the companies began to feel that ruin would soon overtake them. At this juncture a young Scottish nobleman, the Earl of Selkirk, as early as 1802 was planning to bring a colony of his Highland countrymen to settle at the south end of Lake Winnipeg. The British Government, fearing that his plan of bringing colonists to Hudson Bay, and then by rapid and portage to the Red River, would fail, refused to his Lordship their countenance in the undertaking.

Having planted some eight hundred Highlanders on Prince Edward Island and a small colony at Balcoon in Upper Canada, Lord Selkirk took advantage of the low price of Hudson's Bay Company stock and, with his friends, bought heavily and gained control of the Hudson's Bay Company. He was bitterly opposed in this by Sir Alexander Mackenzie, the most prominent man of the Canadian company. For better or worse, Lord Selkirk's first colonists to the Far West left the Scottish Hebrides by ship in 1811 and reached York Factory on Hudson Bay. After a miserable winter they ascended the stream from the fort in heavy boats, and the first party reached the site, on the banks of the Red River, where the city of Winnipeg now stands, on the 25th of August, 1812.

This is accordingly the natal day of the Selkirk Colony, and other parties followed. In 1815 some one or two hundred of the colonists were induced by one Duncan Cameron, an officer of the North-West Company, who wore a flaring red coat and acted "le grand Seigneur," to leave the country. The fugitives settled again in Upper Canada. After their departure the strongest band of the colonists arrived. Jealousy, assaults, and in some cases fatal violence, prevailed. Lord Selkirk's first

Governor, Miles Macdonell, having been arrested by the Nor'-Westers, the founder sent out a military officer, Robert Semple, to be Governor. The new military Governor seized Fort Gibraltar, demolished it, and floated the material down the Red River to Point Douglas.

Hostilities now commenced in earnest; the Nor'-Westers were roused. They stirred up the Bois-brulés on the Western prairies, and sent an expedition westward from Fort William. The mounted Western hunters came down to the Red River, and crossed the prairie in sight of Fort Douglas. A parley between them and the Governor took place, and seemingly, by the accidental discharge of a gun, a fusilade began, and Governor Semple, his staff and a few others, numbering in all twenty-one persons, were killed. This took place at Seven Oaks on June 22nd, 1816, and the spot is marked by a monument on Main Street a little north of the city of Winnipeg. Fort Douglas was then seized by the Bois-brulés.

In the following year Lord Selkirk arrived on the banks of the Red River with a band of several hundreds of discharged soldiers and voyageurs, whom he had hired as settlers in Canada. Fort Douglas was retaken, and the founder, after settling many things, including a treaty with the Indians, took his departure on the arrival of Commissioner Coltman, by whom the matter was concluded. In a few years the conflicts ceased, so that after much negotiation the two companies united in 1821, under the name of the Hudson's Bay Company. The new Governor was George, afterwards Sir George Simpson, of Scottish origin, a man of the greatest ability who succeeded in thoroughly consolidating the new organization.

While this fierce contest was raging on the east side of the Rocky Mountains, the North-West Company was vigorously pushing westward its posts, and fixed its eye

upon Oregon and New Caledonia, as the regions on the west side of the Rocky Mountains were called. No doubt this movement was stimulated by the fact that an American vessel had in 1792 entered the mouth of the Columbia River from the Pacific Ocean. After this event, two American explorers, Captains Lewis and Clark, ascended in 1805 the Missouri River and crossed the Rocky Mountains, as described in Washington Irving's rather inaccurate work known as "Astoria." John Jacob Astor, a New York merchant, shortly afterwards planned a fur-trading expedition to the Pacific Coast, visited Montreal, induced a number of Nor'-Wester traders to enter his services, and sent them by ship around Cape Horn to enter from the Pacific Ocean into the mouth of the Columbia River and found his trading post of Astoria.

An expedition of the North-West Company, under the leadership of Astronomer Thompson of that company, hurriedly crossed the Rocky Mountains and sought to forestall Astor's expedition. The Canadian expedition was too late to prevent the founding of the American post, but this incident happening at the time of the war with the United States in 1812, the post was seized by the Nor'-Westers; it was afterwards purchased from Astor, and his employees were taken back into the North-West Company. The northern part of the coast was known as New Caledonia, the majority of its traders being of Scotch descent. After the union of the North-West and Hudson's Bay Companies under the name of the latter, the trade was carried on in the Pacific department with more energy than ever. The boundary question between the British and American possessions long continued a matter of dispute. At length by the adoption of the Ashburton Treaty of 1842, which was ratified in 1846, the territory south of the Columbia River up to 49° N. lat. was given to the United States, though the Hudson's Bay Company had large posts

and much trade in this district. This decision led to the transfer of Chief Factor James Douglas, afterwards Sir James Douglas, from the Columbia River to Vancouver Island, and here he founded the fort around which grew up the city of Victoria.

The mainland of the Pacific Coast and the island of Vancouver belonging to Britain, were both controlled for many years by the Hudson's Bay Company, till after various changes they were united in 1866 into British Columbia, which remained a British Crown colony for several years. It was an autonomous province until its entrance in 1871 into the Dominion of Canada.

Coming back to the east of the Rocky Mountains, we find that about this time on the banks of the Red River the first Fort Garry was built. Lower Fort Garry being erected in 1831. Lord Selkirk, discouraged by lawsuits in Canada and by the troubles of his colonists, died in France in 1820. The land, forts and other establishments belonging to the Colonizer were administered for fifteen years after his death at great expense, and were then sold to the Hudson's Bay Company. In the year 1835 a government was organized for the Red River settlement, and a number of the leading settlers and more notable persons were selected by the Hudson's Bay Company and made into the Council of Assiniboia, as they now called the Red River settlement. The colony grew slowly, till in 1869 it numbered about 12,000 people, 5,000 French half-breeds, 5,000 English-speaking half-breeds, and 2,000 whites, the last including the Hudson's Bay officers and their descendants, the Selkirk colonists, and a few Canadians and Americans. Outside of this settlement up to the Rocky Mountains practically no settlers dwelt, apart from the officers of the Hudson's Bay Company.

Agitation had at times taken place among the people of Red River settlement to protect their liberties against

this Council, which was still a body appointed by the Hudson's Bay Company, responsible for the government of the country. About the year 1849 a number of French half-breeds rescued one of their number from the hands of a severe judge and carried the prisoner away, crying, "Le Commerce est libre."

Large petitions which were numerous signed by the settlers, had been sent over to England in 1847. A brilliant lawyer and educationalist in London, A. K. Isbister, who was a native of the Hudson's Bay Territories, a man of Arcadian and Indian descent, became the trusted advocate of the people of the Red River settlement. This true son of Rupert's Land afterwards left \$83,000 to the University of Manitoba. Further agitation led to the appointment of a committee of the House of Commons in 1857, and a voluminous blue book marks the era which led to the opening up of the whole Canadian West. Canadian public men crossed the Atlantic again and again to England, until at length, through the good offices of Mr. Gladstone, it was decided that Canada should come into possession of Rupert's Land and the Indian Territories, on the payment of a million and a half of dollars to quiet the claim of the Hudson's Bay Company. The better elements of the Red River settlement were now in great hopes for the future of their country. But a cloud overshadowed their bright visions. So far back as 1857 the Canadian Government had despatched to Rupert's Land a geological and topographical expedition under Professor Hine. About the same time Great Britain sent the Palliser-Hector expedition to spy out the land and make a report. Even during these expeditions some question was raised as to whether such parties should be sent at will to explore the country. Again, in 1869, when it was thought that the transfer of the fur trader's land to Canada was probable, the Canadian Government sent out surveying parties to block out the land for incoming settlers. The surveyors chanced to begin in the rear

of the French parishes, which lay to the south of Fort Garry. The surveyors showed themselves as discourteous to the native people as their masters, the Government at Ottawa, had shown themselves in ignoring the whole body of Red River settlers. The action of the Ottawa Government in this matter is almost unaccountable. They failed to send a message, have a conference, or in the slightest extent recognize the twelve thousand people in the confines of Assiniboia. The Hudson's Bay Company officials resident in the country were far from enthusiastic about the establishment of the new regime. All trouble might have been avoided by a small amount of tact and conciliation.

The Hon. William McDougall of the Canadian Parliament, who had taken much part in the opening up of the west, and who really had the best interests of the new country at heart, came through the United States to the boundary of Manitoba to take possession of the new land.

Suddenly the French Metis, under a vainglorious but impulsive leader of their own blood, Louis Riel, following the tactics of their race in Paris, erected, some nine miles south of Fort Garry, a "barrière" and sent a hostile message to the incoming Governor. With a band of French half-breeds, Riel next seized Fort Garry, the Hudson's Bay Company making no active opposition. The English-speaking people were paralyzed, efforts were made to restore peace, but the French held the Fort. Mr. Donald A. Smith, now Lord Strathcona, a high officer of the Hudson's Bay Company, came post haste over the American prairies in the dead of winter as Commissioner of the Canadian Government. He took up his abode in Fort Garry, where Riel had also made his headquarters, and succeeded in undermining the rebel chieftain's power.

Up to this time all the illegal acts of the rebel leader might have been pardoned, had not Riel, with unaccountable wisdom, put to death by public execution a

Grand Trunk Pacific and their branches. The prosperous condition of these railways now justifies the building of the Hudson Bay Railway, which will give a route, with a sea voyage from Fort Churchill to Liverpool, shorter than from New York to any British port.

As to population, Manitoba began with some 12,000 people in 1870, and now is estimated to possess about 400,000 of a population, partly made up of large numbers of foreigners from the continent of Europe, as well as of many settlers from the United States.

Two great problems have, in the provincial history of nearly forty years, been of transcendent importance. First came the great agitation for obtaining in the face of the bargain with the Canadian Pacific Railway the right of the province to build its own railways. This fierce and determined struggle ended in the province gaining the same rights in this respect as those possessed by any other province. The other question, which for some ten years disturbed the province and even spread into an excitement over the whole Dominion, was the introduction of a non-denominational system of public school education. This question was also decided in favor of the province.

THE NORTH-WEST TERRITORIES

The name 'North-West Territories' was used in regard to the old region of Rupert's Land, whose rivers ran to Hudson Bay, and also in reference to the wide extent known as the Indian Territories, occupying the slope which is drained into the Arctic Ocean. After Manitoba had been taken from these territories and organized into a province, the remainder was, under an Act passed by the Mackenzie Government of Canada in 1875, placed under the North-west Territories Act, and a Governor, with advisers, was given to them. He resided in the Territories, first at Fort Pelly, then at Battleford, and

subsequently at Regina. The Territories were also placed under a strict Prohibitory Liquor Law. Money grants were passed for the various departments of the public service by the Dominion Government. In course of time a Local Legislature was granted to the Territories, in view of the large influx of settlers pouring in. So great was this increase that the Territories grew to have a population of two-thirds that of Manitoba. In 1905 the Dominion Parliament at Ottawa passed legislation forming two great provinces lying between Manitoba and the Rocky Mountains and extending from 49° N. the International Boundary line to lat. 60° N.

SASKATCHEWAN

The first of these autonomous provinces is Saskatchewan. It has the vast extent of 250,650 square miles, and is possessed of the greatest agricultural possibilities. It is in its southern half chiefly a prairie; its northern regions are covered with forests. The south-western part of the prairie is chiefly adapted for ranching, some portions of it needing irrigation, but the greater part of the province is adapted for the growth of cereals and for mixed farming. Its population is about 250,000. The province has a large proportion of the old settlements made up of Canadians from the eastern provinces, but in the last decade vast numbers of foreigners from the continent of Europe, and Americans have become British subjects in Saskatchewan. Many of those who have come from the United States are repatriated Canadians or their children. The capital of Saskatchewan is the city of Regina, which in the last few years has built up rapidly. Near by is the city of Moosejaw, a railway centre created by the Canadian Pacific Railway, which rivals the capital in population. The city of Prince Albert, near the present northerly line of settlement of the province, is beautifully situated on the Saskatchewan

River, and, being on the verge of the wooded district, may be considered the lumber metropolis. Between Regina and Prince Albert is the remarkable railway city of Saskatoon, made by the three great lines of railway crossing the South Saskatchewan River at this place. The province of Saskatchewan has attracted a most enterprising population, and bids fair to be most influential in the counsels of the Dominion. It has a well organized system of primary and secondary schools, and has taken steps to establish a University.

ALBERTA

The sister province of Alberta is more broken in surface, and from being near the Rocky Mountains is more varied in topographical features than Saskatchewan. It has an area of 252,540 square miles, though possessing a population of about 100,000. It contains land of every variety, forest lands and prairie, lands for grazing and grain growing, with a large portion of the southern part of the province demands irrigation. It has vast coal deposits of lignite, bituminous and anthracite coal, and at points, such as Medicine Hat, great reservoirs of natural gas. The capital of the province is Edmonton, a city beautifully situated on the North Saskatchewan River, and the depot of the great fur trade of the vast Mackenzie and Peace River districts. It has grown with great rapidity, and is recognized by the railways as the great centre of the North-western prairies. The second city of the province is Calgary, on the main line of the Canadian Pacific Railway. It has been more steady in growth than Edmonton, is about the same size, and is an important wholesale centre for Alberta. Railways run from Calgary to the different parts of Southern Alberta and connect with the American system of railways. Two places of some importance are found in Southern Alberta: Lethbridge, a coal centre, and Medi-

cine Hat, with manufacturing ambitions. The irrigation works of Southern Alberta are notable, and in recent years, by the introduction of winter wheat, Southern Alberta is becoming a wheat-growing district. The population of Alberta is very mixed; it has a Canadian basis, with large settlements of European foreigners and an American population, of which considerable numbers to the south of Lethbridge are Mormons.

BRITISH COLUMBIA

Mention has been made already of the early occupation of the region beyond the Rocky Mountains. The early history of British Columbia was, outside of the fur-trading interests, of very little note.

The rush for gold 1857-8 added a few thousands of people for a time, but they chiefly left for different parts of the world when the gold fever subsided. When the province entered the Dominion in 1871 the population was estimated at 17,000, and these were mainly in the old centres of Victoria, New Westminster and Nanaimo, with ranching settlements up the valleys of the Fraser, the Thompson and the Kootenay Rivers. The increase of population in British Columbia has not been so rapid as that of the prairie provinces, although the growth of the city of Vancouver, the terminus of the Canadian Pacific Railway, has been remarkable. The population, which gathered around the Hudson's Bay Company establishments, was chiefly English, mixed with a large element coming up the Coast from San Francisco and California. Being mountainous—it has indeed been called a sea mountain—and lying on the sea, British Columbia has a great variety of resources. The salmon and deep sea halibut fishing of British Columbia, along with the seal fishing up the coast has always been a source of wealth to the coast cities. Victoria, the capital on Vancouver Island, was the earlier and more important

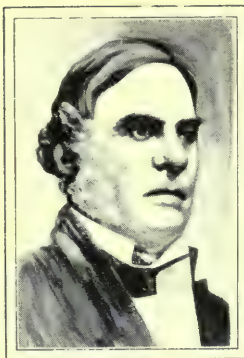
trade centre. New Westminster on the Fraser River had the inland trade up the river. Nanaimo has long been famous as the greatest coal-producing centre on the Pacific Coast, supplying large quantities to San Francisco. The choice of Vancouver city on Burrard Inlet, by the Canadian Pacific railway in 1885-6, at once made a new trade centre. The establishment of great Pacific lines of ships to China and Australia from the port of Vancouver has built up the city, while the easier access to the upper country by railway has largely given Vancouver, with its 70,000 of population, the leading place in the province.

The mountains of British Columbia are rich in gold, silver, copper and other minerals. The central district of Upper British Columbia along the Kootenay River, and the adjacent region have attracted population and brought in capital for the mines. The most considerable place in this district is the town of Nelson. But the greatest resource of British Columbia at present is the forests with their enormous growth of pines and firs of different varieties. The timber export from British Columbia to every part of the prairie provinces, as well as to different parts of the world, by sea from Vancouver is enormous. Being on the western coast of the continent, the climate of British Columbia is moderated by the Pacific current, just as that of the British Isles is by the Gulf stream. Accordingly the valleys of British Columbia, especially on the Kootenay, Okanagan and Shuswap Lakes are well adapted for growing fruit, as are all the valleys of the Fraser and Thompson. In many parts, however, irrigation is necessary for this industry. The soil of the great interior of British Columbia is largely made from disintegrated volcanic rocks, and is said to be specially suitable for plant growing. The fact that the prairie provinces are not adapted for growing other than small fruits gives this industry of British Columbia a great opportu-

nity for development. British Columbia had before the building of the Canadian Pacific Railway no intercourse whatever with the prairie regions, nor with Eastern Canada. For years after the province entered the Dominion, much discontent prevailed with the terms of Confederation. This was practically allayed by the completion of the Canadian Pacific Railway in 1886. The presence of large numbers of Chinese, Japanese and Hindoos has given rise to great prejudice and even personal opposition to the Asiatics in British Columbia. Laws for the exclusion of these classes have been passed by the British Columbia Legislature, but these have been vetoed by the Canadian Government on account of British treaties and interests requiring friendly relations with Asiatic nations. The building of the Grand Trunk Railway through the northern part of British Columbia towards its terminus, Prince Rupert, will open a new region of country and introduce a large Canadian population. An educational system has, with much expense and Government assistance, been maintained in the scattered settlements in the valleys and ranching districts, and many centres of the province. No provincial University has yet been founded in British Columbia.

WESTERN CANADA

The later development as a field for settlement of the four provinces now described, and their separation from Eastern Canada by the great stretch of unoccupied territory has naturally led to a diversity of interest between the agricultural and manufacturing conditions of the West and the East of Canada. New communities, moreover, are apt to be assertive and dictatory. In consequence of this it has been a constant line of policy among the better class of Western Canadians to resent the local feeling where too exaggerated, and to plead for a United



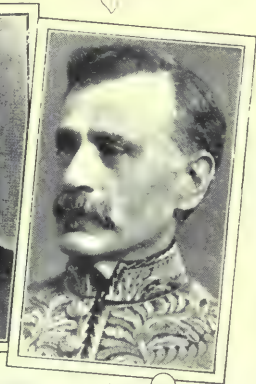
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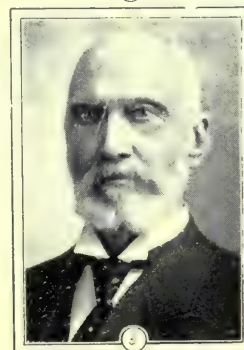
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1. The Honorable Sir James Douglas, First Governor of British Columbia
2. His Honor G. H. V. Bulyea, First Lieutenant-Governor of Alberta.
3. His Honor Sir Adams G. Archibald, First Lieutenant-Gov'r of Manitoba
4. His Honor A. E. Forget, First Lieutenant-Governor of Saskatchewan.
5. The Honorable David Laird, First Lieut.-Gov'r of Northwest Territories

Canada. The cry "Manitoba First" or "British Columbia First" is a dangerous and troublesome one. No one doubts that Western Canadians are as thoroughly loyal to the British Crown, the British Constitution and the British Empire, as Eastern Canadians are. Well nigh forty years of Confederation has, it is to be hoped, led the West beyond most of the dangers of young communities. The prosperity of the West and the spread of a Canadian spirit has been largely brought out by a few causes worthy of mention. The interests of Western Canada have been strong in the imagination of the two great statesmen Premiers of the Dominion—Sir John A. Macdonald (1878-1896) and Sir Wilfrid Laurier (1896-1909). They have both been enthusiastic for the West, both have made their policy national and not local, both have laboured and planned for the greater Canada. The systems of public school and University education brought to the Western provinces have been thoroughly Canadian. Besides, the flow of population from the East formerly going to the United States because new fields of activity were needed, has been turned to our Western provinces, and the proportion of young Canadian University graduates who have come to us has been very large. These as educated men have given a character to our provincial life in its legislative and educational aspects. Religious organizations have also done their share. The great self-supporting churches of the Dominion—Roman Catholic, Episcopalian, Presbyterian and Methodist—have lavished men and money from Canadian sources to mould the West. In this the Canadian Western movement has greatly exceeded that of the United States, for in the United States the movement of the churches fell behind that of the people. In Western Canada the Canadian missionaries of the different churches have kept abreast of the forward line of settlement. The national, educational and religious movements of Canada have thus been strong and uninter-

rupted, and now the Canadian spirit takes hold of the newcomer, who, if he come from the continent of Europe, is at once ambitious to learn the English tongue and to embrace Canadian customs. These considerations constitute an adequate reply to ardent Imperialists, who fear the results of the admission into the country of such a large foreign element. There is nothing in the immediate outlook to warrant anxiety, and Canada need have no fear for the future.

THE CITY OF WINNIPEG

Winnipeg, the capital of Manitoba, is situated at the junction of the Assiniboine and Red Rivers, in the middle of a wide plain. The Red River valley being of exceptional richness, early attracted the traders, and so, in the beginning of the nineteenth century, gained the attention of Lord Selkirk, a benevolent Scottish nobleman, who sent out in 1811-15 several hundreds of Highland settlers. On the site at the junction of the two rivers where, as before said, Verandrye—the first white explorer to visit the Red River—had three quarters of a century before this time erected Fort Rouge, and where, a decade before, the Nor'-Westers of Montreal had built Fort Gibraltar, the Hudson's Bay Company added Fort Douglas, so named after the family name of Lord Selkirk. After bloodshed between the rival fur companies and their union in 1821, Fort Garry (1) was built as a trading post and settlers' depot. Afterward with a more elaborate structure, stone walls, bastions and port holes, Fort Garry (2) was constructed at a considerable cost in 1853. A short distance north of this fort, about the year 1860, the first house on the plain was erected, and to the hamlet rising there was given the name of the Lake, 45 miles north, Winnipeg (Cree: Win, murky; nipi, water). The name referred to the contrast between its water and that of the transparent

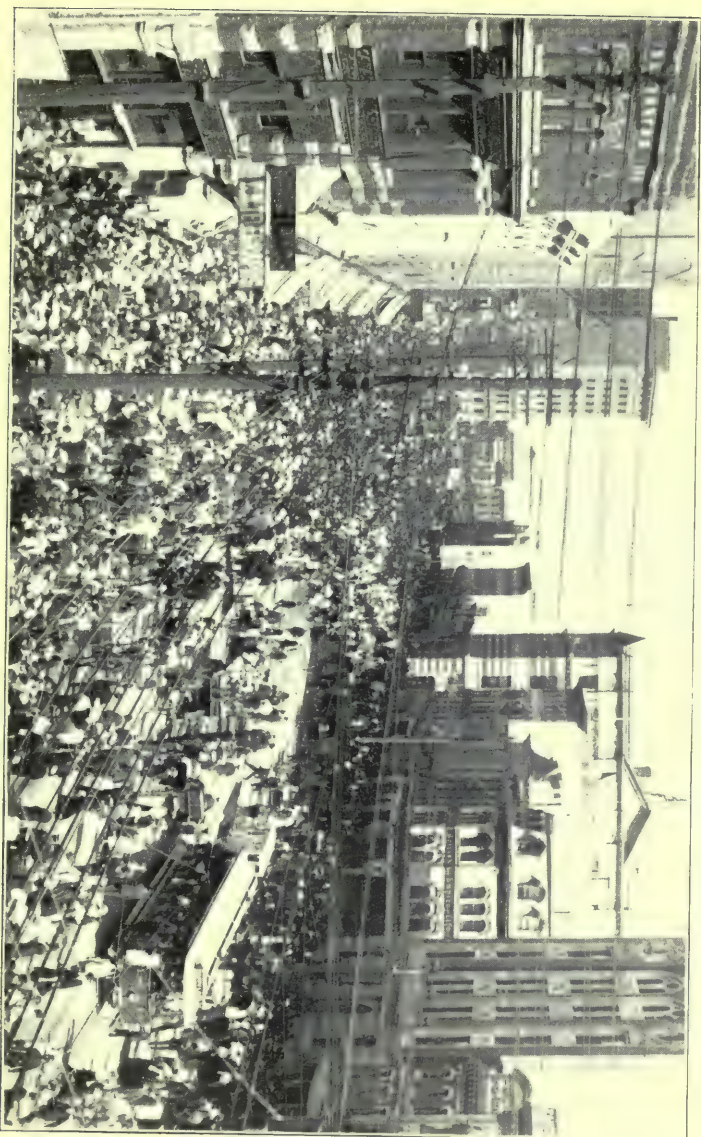
lakes to the East. For ten years the hamlet grew, though very slowly, since it was more than four hundred miles from St. Paul, the nearest town in Minnesota, to the south. The fur traders did not seek to increase its size. When the transfer of Rupert's Land to Canada took place in 1870 the Governor of Assiniboia had his residence at Fort Garry, and here was the centre of Government for the settlers in the surrounding area. The acquisition of Manitoba by Canada, and the influx of settlers from Eastern Canada led to the greater importance of Winnipeg, as the new town was now generally called. The establishment of Dominion Government agencies, the formation of a Local Government and the machinery required for the Government of the province, the influx of a small army of surveyors, who mapped out and surveyed many districts of the country, and the taking up of free lands in all directions by Canadian settlers, all helped to build up the village of Winnipeg into a considerable town.

THE CITY OF WINNIPEG

By C. F. ROLAND, Esq., Winnipeg.

WHATEVER may have been Lord Selkirk's original intention when he bought a controlling interest in the then depreciated stock of the Hudson's Bay Company, the outcome, so far as the early settlers were concerned, was that these people had exceedingly hard times in Western Canada. In these early days what was known as Canada lay hundreds of miles to the eastward, and the great Northwest was a wilderness of value only to trappers who sought the pelts of fur-bearing animals for the two great corporations, the Hudson's Bay and the Northwest Companies. The rigours of a climate far more severe than they had been accustomed to, assailed the pioneers from Scotland and Ireland who made up the first Selkirk parties. They had few tools suitable for tilling the tough prairie sod, and most of them lacked the agricultural lore necessary to attain success. They were unskilled in hunting and had no suitable weapons for the killing of game, nor any horses for chasing the buffalo that roamed the plains in thousands during the summer until the fierce storms of winter drove them southward. The chief business of the country was the gathering of furs, and between the upper and nether millstones of the two companies that engaged in this business in sharp, bitter and even deadly rivalry, the colonists were caught and ground so severely that they were fairly at a loss to know what to do to maintain a position which should enable them to keep the good will of one party without incurring the enmity of the other.

Six years after the arrival of the first contingent of Selkirk settlers, a plague of grasshoppers for several successive years, devoured the grain crops which the colonists had been able to grow with infinite toil.



Main Street, Winnipeg

The great flood of 1826 was another disaster that wrought havoc to the settlers' hopes. Because of these troubles and others of a lesser but still serious nature, many of the colonists left the country seeking better conditions of life than they found under the auspices of the noble Earl. On June 19th, 1816, matters were brought to a climax between the rival fur-trading parties by the Seven Oaks massacre, in which twenty-one on the side of the Hudson's Bay and one man of the Northwest Company lost their lives. This sanguinary episode gave pause to both parties in the fight for trade supremacy. There can be no doubt that after this incident life for the Selkirk settlers on the banks of the Red River, became more endurable.

After the grasshopper plague had passed in 1823, the grain crops became again abundant, and the settlement at Kildonan, out of which grew the City of Winnipeg, became more firmly established. It was many years, however, before the growth began which in less than forty years has made a city of 130,000 people from a tiny village. The Seven Oaks affray called the attention of the home Government in England more closely to the seriousness of the quarrel in the Northwest between the fur-trading companies, and stricter supervision resulted. Trade sprang up between the settlements on the Red River and the United States settlements to the South. The richness of the soil, and the ease of cultivation becoming known to more people, settlers came into the country, not only from Great Britain by the way of Hudson's Bay, but also from Eastern Canada and the United States. In 1862, the first steamboat — the Anson Northup — navigated the upper Red River as far as Fort Garry with a good cargo of freight and a number of passengers, a great event for the colonists of those days.

Realizing their need of a more stable Government, the Northwest territories petitioned the Canadian Govern-

ment in 1857 to include them in the Dominion. This step was not actually carried out for some years; the confederation was finally decided upon and entered into in 1869, the Northwest territories becoming a part of Canada. The Hudson's Bay Company was paid £300,000 as an indemnity.

This act of confederation brought on the first Riel Rebellion which grew out of claims made by the half-breeds that they were the real owners of the land and should receive payment for it. The half-breeds heavily outnumbered the whites, and led by Louis Riel, a French half-breed of some ability and much initiative, made prisoners the white population of the Winnipeg settlement. These were confined in Upper Fort Garry and one man, Thomas Scott, was executed. The others were released after having been imprisoned in the Fort for some weeks. Troops sent from the East brought order out of the chaos into which the Riel Rebellion had plunged the public affairs of the Red river settlement, and from that time the tiny trading post at the junction of the Red and Assiniboine rivers, took on a new character. In 1870 the first census of Winnipeg was taken, and showed 213 persons in the village. Eleven years afterwards, in 1881, there were 7,985 people, and Winnipeg had been an incorporated city since 1874. By leaps and bounds the city's growth has advanced. In 1891 the population was 27,068. In 1901 it had grown to 44,778, and during the five years from 1900 to 1906, the city more than doubled its population. This increase was chiefly due to immigration from Great Britain, other European countries, and the United States. More than ten thousand of the present population of 130,000 resident within the city limits have come from the United States. Geographically, Winnipeg is situated almost halfway between the Atlantic and Pacific coasts of British North America, and sixty miles north of the boundary line between Canada and the United States.

Politically, it is the capital of the province of Manitoba, and commercially, the leading city of Western Canada.

The government of the city is carried on under a Charter from the Provincial Legislature. The Council is composed of a Mayor, four Controllers forming the Board of Control, and fourteen Aldermen. The Mayor and Controllers are elected annually by vote of the entire city. One Alderman is elected annually from each of the seven wards into which the city is divided, and holds office for a term of two years. The Mayor is Chief Magistrate of the city. Persons eligible for election as Mayor and Controller must be owners of property rated on the assessment roll of the city to the value of two thousand dollars. Aldermen must possess property rated in like manner to the amount of five hundred dollars. Nominations and elections are held annually in December.

The Board of Control is the executive body, and as such deals with all financial matters, regulates and supervises expenditures, revenues and investments. It also directs and controls departments, nominates all heads of departments, prepares specifications, advertises for tenders and awards all contracts for works, materials and supplies required. It further inspects and reports to the Council upon all municipal works being carried on or in progress, and generally administers the affairs of the city. The public schools are under the control of the Public School Board, elected annually by the rate-payers. The police department is under the authority of the Board of Police Commissioners, which consists of the Mayor, the County Court Judge, the Police Magistrate and two Aldermen appointed by the Council.

The present Mayor of Winnipeg is W. Sanford Evans, elected in December 1908 to succeed Mayor James H. Ashdown, the latter declining a nomination for a third term. Since the first election of a mayor of Winnipeg in 1874, the city has had the following twenty-two chief

Executives — including Mr. Evans the present Mayor :

- 1874 Francis Evans Cornish, Q. C.
- 1875 William Nassau Kennedy.
- 1876 William Nassau Kennedy.
- 1877 Thomas Scott.
- 1878 Thomas Scott.
- 1879 Alexander Logan.
- 1880 Alexander Logan.
- 1881 Elias George Conklin.
- 1882 Alexander Logan.
- 1883 Alexander McMicken.
- 1884 Alexander Logan.
- 1885 Charles Edward Hamilton.
- 1886 Henry Shaver Weshook.
- 1887 Lyman Melvin Jones.
- 1888 Lyman Melvin Jones.
- 1889 Thomas Ryan.
- 1890 Alfred Pearson.
- 1891 Alfred Pearson.
- 1892 Alexander McDonald.
- 1893 Thomas William Taylor.
- 1894 Thomas William Taylor.
- 1895 Thomas Gilroy.
- 1896 Richard Willis Jameson.
- 1897 William F. McCreary.
- 1898 Alfred J. Andrews.
- 1899 Alfred J. Andrews.
- 1900 Horace Wilson.
- 1901 John Arbuthnot.
- 1902 John Arbuthnot.
- 1903 John Arbuthnot.
- 1904 Thomas Sharpe.
- 1905 Thomas Sharpe.
- 1906 Thomas Sharpe.
- 1907 James H. Ashdown.
- 1908 James H. Ashdown.
- 1909 W. Sanford Evans.

During the thirty-four years that these gentlemen have filled the mayor's office, the city has made wonderful progress.

Condensed and reduced to figures, the growth of Winnipeg since 1890 is given in the following table:

Year	Real	Personal	Total	Popu-
April	Property	Property	Assessable Property	lation
1891	\$17,587,420	\$2,365,850	\$19,994,270	27,068
1892	17,845,450	2,492,650	20,338,100	29,182
1893	18,658,200	3,034,000	21,692,300	32,119
1894	18,760,950	3,240,380	22,001,330	34,954
1895	19,125,510	3,043,480	22,168,990	37,124
1896	19,498,660	2,061,770	22,650,430	37,983
1897	19,745,930	3,086,090	22,832,020	38,733
1898	19,670,680	3,181,020	22,851,700	39,384
1899	20,049,890	3,469,630	23,519,520	40,112
1900	21,316,000	3,761,460	25,077,460	42,534
1901	22,355,600	4,050,170	26,405,770	44,778
1902	23,938,860	4,676,950	28,615,810	48,411
1903	30,873,910	5,399,490	36,273,400	56,603
1904	41,106,870	7,108,080	48,214,950	67,265
1905	53,786,070	8,941,560	62,727,630	72,795
1906	69,624,550	10,887,175	80,511,725	101,057
1907	93,855,500	12,333,333	106,188,833	111,717
1908	102,790,170	13,316,220	116,106,390	118,252

The growth of the public school system is of considerable interest, and is shown in the following table:

Year	Teach- ers	Build- ing	Cost	Pupils
1871	1	1		35
1876	4	2	\$ 3,500	123
1886	49	11	220,000	2,831
1896	96	14	397,700	6,374
1900	119	16	487,000	7,500
1903	140	18	750,000	9,500

1904.	168	19	774,500	10,308
1905.	192	21	1,071,701	11,675
1906.	220	26	1,213,931	13,445
1907.	248	30	1,700,000	14,835
1908.	267	33	2,000,000	15,499

The city's public school system is well housed in buildings of the most modern and substantial construction. By an Act of 1890 and subsequent amending Acts it is provided that all state-aided schools shall be free and non-sectarian. The school system is directed by a department of the Provincial Civil service known as the Department of Education presided over by the Minister of Education (at present the Hon. G. R. Coldwell, K.C.) and his deputy (Mr. R. Fletcher, B.A.). There is an advisory board for the purpose of assisting the department in more technical matters. This board consists of ten members appointed by the department and other bodies. Provision is made for both primary and secondary education, the primary course extending over eight years. In the rural districts of the Province which are sparsely populated, the schools are small and the attendance is irregular.

In many communities where there is a variety of race and language, bi-lingual schools have been established, but it has been found necessary to organize a Ruthenian Normal school for the training of teachers for schools for this class of pupils. There are two Ruthenian schools in the Province, one in Winnipeg and one in Brandon. The language question in the city schools presents little difficulty as there is always a certain number of English-speaking children; the teachers speak English, and the foreign children learn the language very quickly.

Secondary education is carried on in the Intermediate and High schools and Collegiate institutes. The Intermediate schools serve the smaller centres of population, and carry on the first two years of High school

work. The High schools and Collegiate institutes offer a choice of three courses, a two years course leading to a certificate of competency in commercial subjects, a three years course leading to matriculation in the University, and a four years course for a teacher's certificate of the first class. Collegiate institutes must have not fewer than four teachers; the Principal must be a University graduate, and the assistants must hold at least first class, grade A, certificates. Principals of High Schools must have at least first class grade A certificates, and the assistants those of first class grade B. Several other institutions organized for higher education, but having preparatory departments as well, do the work of a secondary school. Their courses for the most part lead to matriculation in the University.

Professional training for teachers is given in the Provincial Normal school and its model school. The Principal is Dr. W. A. McIntyre and this school is the centre of the system. Its work goes far to determine the ideals and aims of its students in training, and the spirit and tone of the schools conducted by them. On its efficiency depends in a large measure the success of the teaching force of the Province. Supervision of the various schools is exercised by means of a corps of experienced and skilled inspectors. The funds for the maintenance of the schools are raised by a general municipal tax sufficient to give to each school district \$240 per annum for each teacher, and by special levy on the land situated within the school district, for whatever sum may be necessary in addition to the amount received from the municipality and the government grant, which is \$130 per school.

At the organization of the Province, two sections of land in each township were set aside for school purposes and a portion of these lands have been sold at good prices. The proceeds of the sale go into the School Lands Fund,

which according to the law governing the matter is invested by the Government in securities bearing three per cent. The revenue thus derived from the fund and the interest on deferred payments are handed over by the Dominion Government for the benefit of the schools. (The question is frequently asked why a fund belonging to the Province, for the maintenance of one of the most important interests of the Province should be invested in securities yielding such a meagre return, when loan companies and other conservative and careful corporations find safe investments that yield them double the rate.)

In addition to the state-aided institutions there are in Winnipeg several excellent private schools. Higher education in the Province is undertaken by the University of Manitoba and certain colleges. The University is a small and by no means beautiful structure. It resembles, in fact, in size and general style the public elementary schools of the city. But it must be explained that the University at present only teaches scientific subjects. Arts, Medicine, and Agriculture are taught in "affiliated" colleges which are scattered in various parts of the city. Thus, the classics and modern languages are taught in the four "affiliated" denominational colleges, St. Boniface (Roman Catholic), St. John's (Church of England), Manitoba College (Presbyterian), and Wesley College (Methodist), Medicine is taught in the Manitoba Medical College, and Agriculture in the Manitoba Agricultural College (Provincial Government) at Tuxedo Park. The University of Manitoba has been a teaching institution for 5 or 6 years. Founded in 1871 as an Examining Board, the University itself at present undertakes instructions in Mathematics, Chemistry, Physics, Botany, Physiology, Pathology and Bacteriology, and Civil and Electrical Engineering. But chairs in English, History and Political Economy have been recently established, and these new departments

will commence work next October. The government and organization of the University is undoubtedly in an unsatisfactory state, and is, in fact, the subject of a Government Commission at the present time. There is a widespread feeling that the Province ought to have a Provincial University of the type provided in many States of the Republic to the South and entirely free from any denominational influences. In addition to the denominational colleges mentioned above there is a Baptist college at Brandon.

Winnipeg is not yet largely provided with learned societies, but two perhaps deserve mention, viz.: the Historical Society and the Scientific Club. There are numerous social clubs and societies of various kinds. Among the former are the Manitoba and Commerical Clubs; prominent among the latter are the Canadian Club of Winnipeg, the Women's Canadian Club and the Women's Musical Club.

The churches of Winnipeg have also kept pace with the city's growth and there are now 115 churches of various denominations in Winnipeg. All of these have been established since 1869 although the Rev. John West, a clergyman of the Church of England, came to the Selkirk colony in 1820, and the Rev. John Black arrived in 1851 to take charge of the Presbyterian congregation.

The bulk of Winnipeg's church-going population is divided between the Presbyterian, Anglican, Roman Catholic and Methodist churches. Calculated on a population basis of 100,000, the religious preference census of Winnipeg shows eighteen per cent Presbyterian; seventeen per cent Church of England; fifteen per cent Roman Catholic; thirteen and a half per cent Methodist; five per cent Baptist; five per cent Hebrews; seven per cent Evangelical Lutheran; three and a quarter per cent Congregational; one per cent Salvation Army; seven and

a quarter per cent of other denominations, and eight per cent with no preference to avow.

Winnipeg, the capital of Manitoba, is the seat of the Provincial government and judiciary. Here are the Provincial Parliament buildings and the chief Law Court of the Province. The present provincial government is of the Conservative party and its chief officers are : The Honorable R. P. Roblin, Premier and Minister of Agriculture, the Honorable Robert Rogers, Minister of Public Works, the Honorable Hugh Armstrong, Provincial Treasurer, the Honorable G. R. Coldwell, Municipal Commissioner and Minister of Education, the Honorable Colin H. Campbell, Attorney-General, the Honorable J. H. Howden, Railway Commissioner and Provincial Secretary. The Manitoba judiciary is modelled upon the British Law Courts system, with Assize Court, County Court, Provincial Police Courts and Civic Police Courts for the different judicial districts and the cities. From the highest Court in the Province—the Court of Appeals—there is a further appeal to the Supreme Court of Canada, and from there to the Privy Council in London. Winnipeg possesses a civic police force of one hundred officers under command of J. C. McRae. This force is deemed insufficient and is to be augmented by the addition of seventy-five officers, the establishment of five sub-stations, the installation of an electric call system, and patrol wagons at each of the stations, central and auxiliary.

The civic government of Winnipeg is marked by a progressive policy in keeping with the remarkable growth of the City. At the present time the municipal officers are: His Worship Mayor W. Sanford Evans; the Board of Control consisting of Mayor Evans, Chairman, R. D. Waugh, J. W. Cockburn, A. A. McArthur, J. G. Harvey; Aldermen F. W. Adams, R. C. McDonald, F. O. Fowler, E. Cass, R. T. Riley, Lendrum McMeans, W. G. Douglas, W. R. Milton, J. R. Gowler, M. Wil-

loughby, F. J. C. Cox, C. Midwinter, J. A. Potter, D. W. McLean.

Municipal ownership is recognized and popular with our citizens, and is widely adopted. The city owns and operates its water-works plant, street lighting system, stone quarry, fire alarm system, asphalt plant and a high pressure plant for the better protection of the city from fire. Winnipeg enjoys the distinction of being the first city in America to acquire a municipal asphalt plant. In 1906, the city purchased a stone quarry for civic improvement purposes, and this quarry is worked for the production of road metal and material for granolithic walks. The material for these granolithic walks is composed of crushed stone, sand and cement. Constructed as they are by the city employees, these sidewalks are practically indestructible. There are more than 78 miles of such pavements in Winnipeg, all of which have been laid down by the civic street department.

Most important of all the municipally owned public utilities is that of a plant which is now in process of construction at Point du Bois for the furnishing of cheap power to consumers in Winnipeg. In 1906 the citizens of Winnipeg passed a by-law authorizing the Council to borrow \$3,250,000 to be used in acquiring this site and installing the necessary plant and works to bring the power to the city. The preliminary surveys and examinations were made in 1906 and the designs commenced in the same year. During 1907 the designs were completed and tenders received. Contracts for building a 24 mile steam railway approaching the works on the Winnipeg River and for clearing the transmission line have been let and this work is nearly completed. Mr. Cecil B. Smith, C. E., is Chief Engineer in charge of the design and construction of this water power development and a Board of Consulting Engineers, composed

of Col. H. N. Ruttan, City Engineer, Winnipeg; Prof. Louis Herdt, Montreal; and Wm. Kennedy, Jr., Montreal have also been appointed to advise upon and assist in the designs. The machinery and plant will be second to none on the continent of North America. When the power is available it is estimated that it can be sold to consumers at the sub-stations in the city at \$18.00 per H. P. per annum for the first installation of about 17,000 horse power. When the demand for power has increased sufficiently to warrant the step, the amount available will be increased to 34,000 H. P. and the cost at sub-stations, it is estimated, will then be reduced to \$13.87 per annum. When the full capacity of the plant shall have been developed—about 60,000 horse power per annum has been fixed at \$12.46 for each unit.

Consumers of electric power in Winnipeg are now supplied by the Winnipeg Electric Railway Company—a private corporation—at a cost of from \$35.00 per horse power per annum upwards, in proportion to the quantity of power consumed. During the early part of the current year, negotiations were entered into between the civic authorities and the Winnipeg Electric Railway Company with a view to purchase, by the city, of the Company's generating power plant at Lac du Bonnet, and of the several other utilities of the Company, including the Winnipeg street car system, the gas plant which now furnishes the city with gas for lighting and fuel, and the domestic electric lighting franchise. These negotiations, however, fell through and several large contracts were let for the work on the municipal power plant the first installation of which is expected to be completed in 1911. In 1905 the city was authorized to proceed with the construction of a municipal gas plant to cost \$600,000. But although some investigations were carried out, no definite proceedings have yet been undertaken.

Of the public utilities owned by Winnipeg, the water-works system is perhaps the most important. Until 1899, the city was supplied with water by a private corporation, but it was decided to take this highly important matter under municipal control and ownership. The present system was thereupon installed—in a small way at first—and has been extended concomitantly with the growth of the city.

In view of the geological formation of the surrounding country artesian wells constitute the only practicable means of obtaining a satisfactory water supply in the immediate neighborhood. The river water is too muddy to be used for a domestic supply without costly filtration; there are no suitable lakes from which a gravitation supply may be obtained within a reasonable distance of the city. In the future, however, the growth of the city will undoubtedly compel the utilization of a distant supply, whatever expense may be involved. For the present the artesian well system is found to yield an adequate supply of water, which, although hard, is practically free from organic impurities.

The Winnipeg water supply is taken from six of these artesian wells which are about 65 feet deep, except well No. (5) which is 110 feet deep, and their capacity is as follows :

- Well No. (2) 3,000,000 gallons.
- Well No. (3) 900,000 gallons.
- Well No. (4) 1,200,000 gallons.
- Well No. (5) 5,000,000 gallons.
- Well No. (6) 1,500,000 gallons.

This gives a daily total supply of ten million gallons which has thus far proved ample for the city's needs. The water is pumped into reservoirs, one of 300,000, and the other of 6,000,000 gallons capacity and from these is distributed to the several parts of the city.

The water, in its natural state contains a large amount of carbonates of lime and magnesium, and in order to remove these constituents the water is put through a softening process, which removes on an average, about sixty-eight per cent. of the hardening substances. This softening plant was installed in 1900 but not all of the city water is subjected to the softening process, although a proposition recently made to accomplish this was rejected on the ground of unnecessary expense. For the purposes of the City Water Works Department, Winnipeg is divided into three districts, and the rates are fixed on the basis of the number of rooms in the houses supplied. For instance for a house containing 4 rooms or less the rate is \$1.50 per quarter, while for a house of 16 rooms the rate is \$5.55 per quarter. The allowance according to the consolidated rate, is 20 gallons per room per day, and special rates are given to manufacturers who use large quantities of water.

Supplementary to the civic water works system, and for the better protection of the city from fire, Winnipeg has a high pressure plant which has been put in actual service within the past few months. Four years were occupied in the construction of this plant, which cost \$1,000,000. The engine house, the heart of the system, is situated on the bank of the Red river at the foot of James street east. The building is of massive brick construction 158 by 92 feet inside measurement and was constructed entirely by day labor. Owing to the character of the soil in that vicinity the excavation for foundations and engine beds had to be carried to a great depth, but the concrete work was pushed throughout the winter of 1906-7 demonstrating that winter construction is perfectly feasible in Manitoba. The solidity of the structure is one of its most striking features. The roof is carried on steel trusses, supported by heavy steel columns, which also carry their share of the weight of the heavy



A Residential Street, Winnipeg

cranes used in handling the machinery. These columns divide the building into two bays, each of which contains three of the six pumping units. Water is drawn through two suction mains 24 inches in diameter, tapering to 16 inches before they drop into the wells, which draw water from the river through a 36-inch concrete culvert, connected with deep water to give freedom from mud at all seasons of the year.

The engines are of producer gas type of the Crossley make, and are of the "Otto" or four cycle construction having single acting tandem cylinders. All parts subject to the high temperature of the exploding gas mixture, are water cooled, and the low tension magnetic ignition system is in duplicate. The four large engines are of 540 brake horse power each when running on producer gas, and have cylinders 32 inches in diameter with 36-inch stroke. The smaller engines are of 250 horse power each with cylinders of 22 inches diameter and 30-inch stroke. For starting these engines, compressed air at 200 pounds pressure, is employed. It is turned into the cylinders as in a steam engine and as soon as the engine is under motion the gas mixture is fed in. The compressor plant consists of two 20-horse power engines driving single acting air compressors. In the gas producer plant any quality of coal may be used, either anthracite, bituminous or lignite, and with anthracite at \$8.50 per ton, the cost of operation is 425 cents per horse power per hour. The plant is now being operated on bituminous slack. The coal is delivered on a spur track at the rear of the main building and is raised by an elevator to the conveyors, which deliver it to the hoppers of the producers. Of these there are four,—two of 1,000-horse power and two of 500-horse power capacity. The producers are of the familiar type, the gas being formed by passing steam and air in definite proportions over the incandescent fuel. From the producers it

passes through the "scrubbers" where it is cleared of certain impurities and delivered to the gasometer outside, which has a capacity of 250,000 cubic feet of gas, or enough to run one engine for eight hours at full load. So complete is the equipment that all of the engines can be started up and a full load put on the mains in five minutes. The total pumping capacity of the plant is 9,000 gallons of water a minute or 23,000,000 gallons a day of 24 hours. In other words the six engines would fill a tank of 1,440 cubic feet in one minute. The four main units are capable of delivering 1,800 gallons of water a minute at a pressure of 300 pounds to the square inch, and as the service requires, other units are readily thrown into action up to the full capacity of the plant.

In practice the action of water at 300 pounds pressure to the inch is tremendous, for this pressure is equivalent to a column of water 700 feet in height. Tests have shown that a column of water can be thrown 200 feet in the air, and with the equipment at the high pressure plant 24 streams of $1\frac{1}{2}$ inches diameter each could be thrown over the top of the Union Bank, the tallest building in Winnipeg, or ten streams of two inches each, an argument which any fire, possible in the city, must needs respect.

Up to the present time the city has installed 78 of the high pressure hydrants and has laid down 7 miles of special water mains of 8, 10, 12 and 20 inch diameter. The hydrants are so arranged that a number of streams from them can be concentrated on any section of the business area thus giving the greatest measure of protection. In addition to these hydrants the city has 1,245 hydrants connected with the domestic pressure. The fire fighting equipment consists of 38,000 feet of $2\frac{1}{2}$ inch hose, 5,500 feet of $3\frac{1}{2}$ inch hose, and 48 branches and tips ranging in size from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches in diameter. In the high pressure district there are three fire halls with

a staff of 60 men. At the pumping station 26 men are employed in three shifts, and in an ordinary running day five tons of coal are used. The estimated annual expense of operation is about \$45,000.

The chief streets of Winnipeg are splendidly wide and smoothly laid in asphalt pavement, with granolithic sidewalks proportionate to the width of the carriage and traffic ways. Residential streets are "boulevarded" and have rows of trees on either side with asphalt pavement and granolithic walks, the whole giving a clean and pleasant appearance. The city parks although small are numerous, but there are some of larger extent in the suburbs, notably the new city park on the Assiniboine River. This park is nearly 300 acres in extent and has been tastefully laid out. There are eight theatres in Winnipeg; three or four of the larger houses are so enterprising as to secure some of the best touring companies on the continent. Owing to the comparative remoteness from other large centres Winnipeg has been able to support for some years a very efficient stock company. Favorite summer resorts for the people of Winnipeg are Winnipeg Beach situated on Lake Winnipeg, and within easy reach of the city; and Kenora on the Lake of the Woods about 100 miles distant.

Winnipeg is very important as a railway centre. But the excellent railroad facilities that now exist are a comparatively recent achievement. The first railway to afford transportation east and west through Manitoba, was the Canadian Pacific, a company that now has some 13,000 miles of track and carries passengers and freight three-quarters of the way round the world by land and sea. This great transportation company is the outgrowth of a government scheme originated about 1870, for the construction of a transcontinental line across the Dominion of Canada. In 1878 when the Conservatives, under Sir John A. Macdonald, were

returned to power, the building of the railway, which had been carried on under the auspices of the government in power, was turned over to a company formed by capitalists for the purpose; the principal terms of the agreement being that the syndicate thus formed should receive \$25,000,000 in cash payments and 25,000,000 acres of land skirting the railroad tracks through the provinces traversed by the line. The Canadian Pacific Railway Company thus became possessed of large tracts of land which were then considered to be of little value, but which have since turned out to be worth a very large sum of money for agricultural and other purposes. The company refused to accept the land along their tracks in parts of British Columbia, and in place of this a new allotment was made of land in the Peace River Valley, through which the Canadian Pacific company became possessed of some 2,000,000 or 3,000,000 acres of the best land of that far north-western country which is as yet so sparsely settled, but which promises to add another section of unexampled richness to the already extensive domains in the Canadian Northwest.

By June, 1881, the Canadian Pacific had completed its tracks across Manitoba, from Winnipeg west to Portage la Prairie and eastward to Kenora, or Rat Portage as it was then called and had also taken over the Pembina branch of the St. Paul, Minneapolis and Manitoba road from Winnipeg to the Manitoba boundary on the south, at Emerson. Since that time the Canadian Pacific Railway has made marvellous progress toward pre-eminence among the railroad systems of the world. It has not only stretched its lines of steel across the entire breadth of the continent of North America, but has built thousands of miles of branch tracks and has instituted great lines of ocean-going vessels on both Atlantic and Pacific. It has also a complete system of passenger

and freight service on the Great Lakes, another fleet on the inland waters of British Columbia, a line of fast boats from Vancouver to Victoria and Seattle and perhaps the most thorough equipment of hotels and hotel service all along the route of travel in Canada, of any railroad company in the world. Immense elevators for the storing of grain must be added to the list of conveniences for the transaction of the business incident to the establishment of such a powerful railroad system, and when it is stated that the development of the Canadian Northwest and that of the Canadian Pacific Railroad have been coincident events, no surprise need be manifested, because there have been on the one side, the numerous and well nigh mandatory calls of the people for greater railroad facilities and on the other, strong and continuous efforts of the corporation to supply these demands to the best of its ability.

In Western Canada all roads lead to Winnipeg. No railway corporation would think of trying to pass through any part of Western Canada from east to west certainly, or from south to north except in the far western part, without touching the prairie city. No traveller thinks of visiting any part of the Canadian Northwest without making Winnipeg one of his principal stopping places. Merchants, manufactures, capitalists, mechanics, and immigrants of all kinds, in short, all sorts and conditions of men who decide to make their home in Western Canada, come in the first place to Winnipeg, and frequently make it their headquarters.

Situated as it is almost in the very heart of the continent, Winnipeg has become not only an important focus of railway traffic, but is also rapidly developing into a great centre of railway industries. It is the home of thousands of railroad employees, and is conspicuously a "railroad town." It is indeed confidently asserted by many that it will soon become one of the greatest railroad centres of the world.

The Winnipeg station of the Canadian Pacific Railway Company is a new and very fine structure. This station is one of the chief centres of human interest in the city, and provides a striking study in nationalities and social conditions, for in its waiting hall are found representative immigrants from almost every country on the face of the globe, and from every rank of society. Mingled together in this motley throng are the poorest of European peasants, impoverished members of aristocratic families, and immigrants, who are better equipped for commencing their career in a new country. There is a fair sprinkling too of wealthy travellers, tourists and others. The varied nature of costume including as it frequently does the Winnipegger's winter uniform, the "coon coat," side by side with the picturesque garb of Central Europe or of China or Japan, adds in no small degree to the interest of the scene. On the whole there are few places where one would encounter a more cosmopolitan or picturesque multitude.

The railway yards of the Canadian Pacific Company are stated to be the largest in existence which are owned by a single corporation. There are 120 miles of track with accommodation for more than 10,000 cars. Conveniently situated west of the city are the central workshops of this company, which are on a specially large scale. In them all sorts of repairs to the rolling stock are carried out, and sufficient men are employed to make up with their wives and families a fair-sized town. Indeed the district of the city in which these people live is often referred to as C. P. R. town, and their total number must be close upon 12,000, the actual number of workmen being 3,500. The population of C. P. R. town is thus more by 4,000 than that of Winnipeg at the time when the railway was constructed.

When, in 1881, the first Canadian Pacific rails were laid west of Winnipeg, the white population of Canada between the Great Lakes and the Rocky Mountains was

66,161. Manitoba contained 59,187 people of whom 8,000 were in Winnipeg. In the Northwest territory there were only 6,971 white people practically all living on the fur trade, while there were 49,500 Indians.

In this territory or three-fourths of the prairie country there was only one white person for every 35 square miles of arable land. To-day there are more than twice as many people in Winnipeg alone as there then were in all of the vast country between the Great Lakes and the Rocky Mountains, and spreading their tracks all over this country are three other great railway systems besides the Canadian Pacific.

Next in importance to the Canadian Pacific is the Canadian Northern Railway which has also undergone a phenomenal growth and is of even more recent establishment than the Canadian Pacific. The following is a short history of the beginning and growth of the Canadian Northern. In 1895 the Charter was obtained for the Lake Manitoba Railway and Canal Company, and in the following year the construction of a railway from Gladstone was commenced. One hundred miles of road were completed by the Autumn of 1896 and at once put in operation. Each year thereafter mileage was added to the Canadian Northern system until in 1909 the road covers or controls no less than 3,000 miles of track. This extends east and west from Fort William, includes a line from Edmonton south to Duluth and numerous branches throughout the three prairie provinces. Plans are now being prepared for the extension of the road west to Vancouver and east to the Atlantic Coast, and this scheme will undoubtedly be carried through within the next few years.

The Winnipeg railway works of the Canadian Northern Railway are large and in the future are certain to constitute one of the chief local industries. New buildings on an extensive scale have just been completed at Fort Rouge and at present a force of nearly 1,000 men is em-

ployed in the various departments. These include the numerous branches of work in connection with the building and repair of rolling stock. As the mileage of the road increases throughout the west this force will be constantly augmented. The group of buildings known as the shops of the Canadian Northern at Fort Rouge, comprise the round house, boiler shops, erecting shops, blacksmith shops, machine shops, coach shops, coach yard and repair tracks.

Up to the present time the Canadian Pacific and the Canadian Northern have been the principal railroads of Western Canada, but the Grand Trunk Pacific is fast approaching completion, and will, when finished, be a means of travel and transportation little, if at all, inferior to the magnificent system built up by the Canadian Pacific. No less ambitious than its predecessors in the field, the Grand Trunk Pacific Company was formed to carry out a stupendous scheme of transcontinental transportation, and, in due season, of ocean navigation also. The company was incorporated in 1903 and has contracts with the Canadian government for the construction and operation of a transcontinental road of which the main line alone will be 3,600 miles long. Branch lines are provided for under a charter granted to a subsidiary company, formed in 1906, which will increase the total mileage by about 5,000 miles. The main line will stretch from Moncton, New Brunswick, to Prince Rupert, British Columbia, and the chief point of division between the two terminal cities is Winnipeg. For purposes of construction, the system is divided into two parts, the eastern and western divisions with Winnipeg as the central point. This gigantic scheme has been undertaken in order that transportation facilities may keep pace with the great flow of immigration and the continuous development of the freight traffic.

The Grand Trunk system in the United States will form a valuable adjunct to the Canadian roads, and will

add to the transcontinental and transoceanic facilities of the latter the service of a railroad which already operates nearly 6,000 miles of track. Besides this great amount of trackage in the States the Grand Trunk system has almost 4,000 miles of road in operation in eastern Canada, and, since the Grand Trunk system and that of the Grand Trunk Pacific are so closely allied as to make the two corporations practically one, the result must be that the portion now known as the Grand Trunk road will be practically added to the Grand Trunk Pacific, thus forming one of the largest, if not actually the largest, transportation company in the world.

Work on all sections of this great new road is proceeding with much dispatch. The Union station in Winnipeg, which is to accommodate the Grand Trunk Pacific, the Canadian Northern and the Great Northern, is approaching completion; and parts of the new road are now open for traffic. Shops and yards that will, when completed, cost about \$5,000,000 are under process of construction, and Winnipeg is clearly destined to figure as largely in the Grand Trunk Pacific as it does in other great railway systems of Canada.

The other great railway system that has its Western Canadian centre in Winnipeg—the Great Northern—has not done so much toward the enlargement of its service in Western Canada as its rivals in the field. From time to time, however, the “big man” of the Great Northern—James J. Hill—has announced his intention of building across the continent in Canada, and there is no doubt that this will be done in time. The Great Northern holds title to a considerable tract of property in Winnipeg, is an important factor in handling the grain crop of the West, and runs some of the best trains that carry passengers between Winnipeg and United States points. And when the Hudson’s Bay railroad is completed to Fort Churchill or Fort Nelson, as the case may be,

Winnipeg will be the chief inland city through which traffic to Europe by the new route will follow. This road has been the dream of transportation men in Northern America for years. Long ago the eyes of those who looked about them for the best means of transportation between the old country and the Canadian Northwest were directed towards the Hudson's Bay route. In the early days of settling the Northwest country, when the great fur-seeking corporation had to transport large quantities of supplies into the country each season, and had also to carry the furs that their trappers gathered for them to their headquarters in England, the company's ships had access to the Northwest Territories by way of the great body of water lying to the north into which that enterprising old Dutch skipper, Hendrick Hudson, found his way on one of his several voyages of discovery. That the great bay that bears his name will become part of a system of transportation over which the grain crop of the north-western part of Canada will find its way to the markets of the old world, appears to be certain.

Winnipeg is nearer to Liverpool by way of Fort Churchill and Hudson's Bay by about 1,117 miles than the Manitoba capital is to the same market by way of Chicago, and 840 miles nearer than by the Canadian Pacific road through Ontario and the eastern provinces to the sea. It should be noted that the saving of distance which will be accomplished by the adoption of the Hudson Bay route is chiefly on the land part of the journey, an important factor in the consideration of freight charges. From Winnipeg to Fort Churchill the proposed port on the bay is but 650 miles and a portion of the distance is already covered by the tracks of the Canadian Northern road.

If, as the latest government report recommends, the road shall be built to Fort Nelson instead of Fort Churchill, the distance will be decreased by eighty-five miles.

This report also touches upon the possibilities of communication by water with Winnipeg as it is considered possible to produce a deep-water sailing course from Hudson's Bay to Winnipeg by following the natural water courses and dredging a deeper channel where it is required.

Great as has been the development of the railways in Western Canada within the past twenty years, when we bear in mind the remarkable and manifold productiveness of the country, there is still a vast field for continued enterprise. It would perhaps be no exaggeration to say that railway construction in this great country is still in its infancy. In the province of Manitoba alone there are still 20,000,000 acres of land available for farming and the handling of the produce of the five or six million acres at present under cultivation is a severe tax upon the railways now in operation. If we add to this the future industrial expansion of the provinces of Saskatchewan and Alberta with an acreage of 159,038,720 and 161,920,000 respectively, and the province of British Columbia with its great resources in mining, lumbering, fishing, and fruit growing, it is difficult to adequately prophesy the magnitude of the future railway development.

The phenomenal growth of Winnipeg has been materially aided by the efficient car service rendered by the Winnipeg Electric Railway Company. The following figures indicate the substantial progress made by the city. The running of the first street car on Main Street from Fort Garry to the City Hall, took place on October 21st, 1882. The hydro-electric power plant at Lac du Bonnet was started in 1903 and completed in 1907. In 1900 less than $3\frac{1}{2}$ million passengers were carried, in 1904 the paid fares had run to $9\frac{1}{2}$ millions, and in 1905 to over 13 millions, in 1906 over $17\frac{1}{2}$ millions, and in 1908, 20,000,000 passengers were carried. The substantial increase resulted in the gross earnings of the company

rising from \$28,132 in 1900, to \$831,736 in 1904; in 1905 the earnings amounted to \$1,119,768, while in 1908 the total earnings had reached the greatly increased figures of \$2,206,000.

At the Lac du Bonnet Falls on the Winnipeg River, about 65 miles from the city of Winnipeg, the Street Railway company has a water power plant capable of developing more than 30,000 horse power, of which under ordinary conditions, certainly 27,000 horse power can be delivered in Winnipeg for use. Installed at a cost of over \$3,000,000 this plant is a model of expert construction and economical production of power. The present capacity of the plant is 28,000 horse power but the company can, at a comparatively small outlay for raising their dam, and installing additional machinery for which provision has been made increase the present capacity by at least 50 per cent. or say 42,000 to 45,000 horse power. The company has also its steam plant, with a capacity of 7,000 horse power in readiness to be used in emergency.

There are 69 hotels in Winnipeg, many of which are well equipped. By far the finest of these is the Royal Alexandra—the Canadian Pacific Station Hotel. The entrance hall or “rotunda” and public rooms are on a magnificent scale and the appointments generally compare favorably with those of any hotel in the world. As might be expected from the nature of Winnipeg’s business and the extent of its ramifications it has become a necessity that the city should be specially well supplied with banks. The various banking houses have established branches and erected costly buildings, which form a striking feature of the business thoroughfares of Winnipeg.

The beginning of banking in the prairie provinces of Western Canada is traceable to the Hudson’s Bay Company. Less than half a century ago there was no means of sending money out of the country except through

their good offices. To send money to New York, Paris or London, it was necessary to buy from them a sixty-day bill drawn on London. This was the only medium of exchange. In 1871 the Dominion Government established a money order office in Winnipeg. This was appreciated, but there was still an urgent need of organized banking institutions. In the same year, 1871, the late Mr. Gilbert McMicken arrived in Winnipeg as receiver-general for the Dominion Government, and opened a savings bank. Very shortly after the opening of the Government savings bank, Mr. Alex. McMicken, son of the receiver-general, opened a private bank in a building which stood on the site now occupied by the Queens Hotel. In December, 1872, the McMicken bank was the only institution of its kind in Manitoba, but on the 10th of that month the Merchants' Bank opened an office in a building on Main street. This was Winnipeg's first chartered bank. From this very modest beginning the present banking system of Winnipeg has grown up, and there are now the following banks in active operation in the city :

Name of Bank	Opened in Winnipeg	Capital Stock		Reserve	Note Circulation Dec., 1906.
		Subscribed	Paid up		
Merchants Bank, 1864.	1873	\$ 6,000,000	\$ 6,000,000	\$ 3,600,000	\$ 5,169,665
Bank of Montreal, 1817.	1876	14,400,000	14,400,000	11,000,000	10,832,790
Imperial Bank, 1875.	1881	4,762,300	4,572,445	4,572,445	3,700,182
Bank of Ottawa, 1874.	1882	3,000,000	3,000,000	3,000,000	2,637,040
Union B'k of Canada, 1865 1882	1882	3,000,000	3,000,000	1,500,000	2,897,690
B. of British North America, 1836.	1886	4,866,666	4,866,666	2,141,333	3,503,606
Molsons Bank, 1855.	1891	3,281,300	3,083,070	3,000,000	2,798,486
Bank of Hochelaga, 1874. 1892	1892	2,000,000	2,000,000	1,600,000	1,923,343
Bank of Commerce, 1867. 1893	1893	10,000,000	10,000,000	5,000,000	8,842,820
Bank of Hamilton, 1872. 1896	1896	2,473,700	2,470,120	2,470,120	2,301,376
Dominion Bank, 1869.	1897	3,000,000	3,000,000	3,900,000	2,691,986
Bank of Nova Scotia, 1832 1899	1899	3,000,000	3,000,000	5,250,000	2,888,777
Eastern Townships Bank, 1859.	1903	2,945,700	2,939,200	1,860,000	2,250,810
Bank of Toronto, 1855.	1905	3,973,100	3,954,640	4,454,640	3,259,105
Traders Bank, 1885.	1905	4,441,600	4,322,537	1,700,000	2,923,630
Northern Bank, 1905.	1905	1,250,000	1,129,592	50,000	900,855
Royal Bank, 1869.	1906	3,900,000	3,900,000	4,390,000	3,780,348
Home Bank, 1906	1906	885,600	821,780	175,000	450,050

Some idea of the recent growth of the banking business of the West—with its central point at Winnipeg—may be gathered from the fact that in 1900 the banks which now have nearly five hundred branches, had only one hundred and thirty-one. An important function of the banking houses of the West is the financing of the grain crop, which they are called upon to perform annually after the harvest season. It is the boast of the bankers that they have never failed to promptly meet the sudden and enormously increased demand for money at this period of the year.

Winnipeg is the natural gateway through which the commerce between Western Canada and territories east and south of Winnipeg. The city has therefore made, and is still making rapid strides as a centre especially of wholesale trade, and is destined to become one of the greatest distributing centres on the continent. It is stated that the annual turnover of the wholesale houses is nearly one hundred million dollars. Naturally enough the exports passing out of Winnipeg are the products of the Northwest, wheat and other grains, cattle, furs, sheep, wool, hogs, horses, oatmeal, flour, hides and wood pulp. The imports are, as is to be expected, manufactured articles from older countries. Winnipeg is a customs port of entry and its imports are increasing in value at the rate of a million or more dollars each year. As illustrating the growth of the city it may be mentioned that buildings of all kinds of a total value of \$50,749,580 have been erected within the past six years. It is estimated that no less a sum than twelve million dollars will be expended in the erection of buildings during the present year. Many of the buildings are of considerable architectural excellence, and it is noticeable that with one exception there are no erections of the skyscraper kind, so common in cities in the United States.

The hasty growth of the city has produced a large

number of buildings of careless and unsubstantial construction, and many of these which were erected in the earlier days when Winnipeg was a raw frontier town still stand side by side with and in striking contrast to the well built modern structures.

In spite of marked disadvantages of situation Winnipeg has, in the course of twenty years, grown from a mere village into a large and prosperous city,¹ and its prosperity has been due almost entirely to the energy and enterprise of its citizens, who at an early date resolved that their city and no other was to be the gateway of the west and the distributing point and financial centre of the great wheat area of Western Canada. Doubtless the excellent climatic conditions of Winnipeg compensate largely for its distance from navigable waters and give it a distinct advantage over its great prototype Chicago. Scarcely has the history of civilization witnessed a more sudden and striking metamorphosis than has taken place in the transformation of the little trading post with its loop-holed fort into a modern city of 130,000 people. The Winnipeg of to-day, with its fine buildings and broad avenues, its churches and colleges, its railways and wholesale houses, is but a promise of the future



Main Street, Winnipeg

INDUSTRIAL MANITOBA

By C. F. ROLAND, Esq., Winnipeg.

MANITOBA as an industrial centre is not of course at all comparable with the great manufacturing districts of the Old World. In considering the Province as a centre of industrial activity, it is to be remembered that Western Canada is the newest of all new countries. It is chiefly agricultural and its native resources are yet scarcely realized.

Its progress, however, in industrial matters has been remarkable. It has developed from a village in which the manufacturing industries were confined to the making of moccasins by Indian squaws, and the turning out of horseshoes, wagon bolts and harrow teeth by the village blacksmith, into the fourth city in all Canada, as estimated by the value of its manufactured products. This, in 1908, was estimated at about \$25,000,000.

Winnipeg is the greatest wheat market in the British Empire. Nearly all of the great grain crop of Western Canada, which in 1908 amounted no less than 222,786,058 bushels of wheat, oats, barley, flax and rye, passes through the city. For many years all the manufactured articles used in Western Canada were imported, but the advantages to be derived from home industries are now beginning to be realized. Numerous home industries depend to a large extent upon mixed farming, which it is now admitted must be adopted to a greater extent than has hitherto been the case.

Some idea of the progress made by Manitoba in industrial development, may be gathered from recent census returns:—The census in Manitoba, in 1881, showed 344 industrial establishments, great and small,

with a total output of \$3,413,026. Ten years later there were 1,031 establishments with a total output of \$10,155,182, that is to say, that there had been an increase of 200 per cent. in ten years. In 1901, the census was taken on a different basis, only establishments employing five or more hands being counted. The 1906 census showed that the ratio of increase was becoming greater with each year. The capital invested has more than trebled in five years, and the amount of salaries paid, and also the output, have more than doubled.

In the five years from 1901 to 1906, Winnipeg made the enormous increase in manufactured products, of one hundred and twenty-five per cent; the value of such goods advanced from \$8,616,248 to \$18,983,290. For the year of 1907, it was estimated that the value of goods manufactured in the City of Winnipeg, amounted to \$22,000,000. There are to-day, one hundred and forty-eight factories and work shops, and no less than 12,000 hands directly employed in these. This number does not include the army of men employed in the municipal departments and the great railway yards of the city, but applies only to those engaged in actual making of goods from raw material.

The results of the last Dominion Census published in 1906, relating to the number of manufacturing firms in Manitoba, the capital invested, the nature and value of goods produced and the amount of money paid out in salaries and wages, are shown in the following table:—

MANUFACTURES OF MANITOBA

CENSUS OF 1906

Name or Kind of Industry.	Capital.	Salaries and Wages.	Value of Product.
Agricultural implements ..	\$117,096	\$28,516	\$101,215
Awnings, tents and sails ..	132,445	24,295	110,000

INDUSTRIAL MANITOBA

59

Blacksmithing	64,100	22,960	57,300
Bread, biscuits and confectionery	530,158	152,294	636,268
Brick, tile and pottery ...	459,590	203,681	477,119
Butter and cheese	145,556	34,079	380,169
Carriages and wagons	207,000	72,000	194,925
Clothing, men's, custom ..	152,850	80,193	194,511
Clothing, women's, custom	33,400	39,205	128,016
Electric light and power ...	3,445,271	233,495	657,005
Flouring andn grist mill products	6,551,443	428,158	8,809,833
Foundry and machine shop products	1,118,177	325,180	1,153,424
Harness and saddlery	496,045	132,577	371,500
Hats, caps and furs	191,027	48,883	171,174
Jewelry and repairs	17,200	19,420	66,000
Lime	413,900	229,807	372,478
Liquors, malt	1,085,000	128,014	843,829
Log products	2,631,525	399,159	1,517,447
Lumber products	1,927,741	452,181	1,245,447
Monuments and tombstones	238,700	80,205	217,500
Plumbing and tinsmithing .	774,400	242,004	912,764
Printing and bookbinding	560,500	198,525	417,548
Printing and publishing ..	971,408	478,133	1,170,170
Pumps and Windmills	46,750	13,830	44,900
Slaughtering and meat packing	928,965	201,420	2,336,000
Slaughtering, not including meat packing	493,001	51,298	660,983
Stone, cut	139,727	117,640	218,621
Tobacco, cigars and cigarettes	231,700	95,402	347,338
All other industries*	3,202,612	1,104,006	3,795,784
Totals	\$27,307,287	\$5,636,560	\$27,609,268
Industries in above employment less than 5 hands .	446,632	109,084	298,336
Industries employing 5 hands and over	26,860,655	5,527,476	27,310,932

*Includes 2 aerated and mineral waters; 1 axle grease; 1 bags, cotton; 1 baking powder and flavoring extracts; 1 boats and canoes; 1 boxes, wooden; 1 brass castings; 1 brooms and brushes; 2 car repairs; 1 cement blocks and tiles; 1 gas, lighting and heating; 2 clothing, men's factory; 1 cocoa and chocolate; 1 coffees and spices; 1 drugs; 1 dyeing and cleaning; 2 furniture and upholstered goods; 1 hairworks; 2 interior decorations; 1 leather, tanned and finished; 1 metallic roofing and flooring; 1 mirrors and plate glass; 1 miscellaneous; 1 oils; 1 patent medicines; 1 photography; 1 picture frames; 1 pop corn; 1 soap; 1 stationary goods; 2 wire fencing; 1 woodworking and turning.

Among the more important work shops and factories in Winnipeg, are those of the Canadian Pacific, the Canadian Northern and the Grand Trunk railroads. The Vulcan Iron Works, the Manitoba Iron Works, the Western Iron Works, the Northern Iron Works, and ten smaller machine shops, in all employing more than 3,650 hands. In addition, there is in Winnipeg an iron rolling-mill, turning out bar and rolled iron, and five plants are engaged in the manufacture of wire fencing of various sorts—a product greatly in demand throughout Western Canada, where fencing material of wood or stone is scarce and the stretches of land that require to be fenced are very great. There are also four factories for making sheet metal cornices and galvanized iron work; seven brick, clay and cement works; two paint factories; two shops that turn out stained glass products; nine planing mills, which manufacture building materials such as sashes and doors, office and bank fittings; one plant which manufactures plaster for hard-finish walls, the raw material being native gypsum.

Five factories which manufacture ready-made clothing, employ 350 hands. Fur garments are also largely made in Winnipeg. Although many furs are dressed in the city, the majority are exported; the annual output of undressed pelts of fur-bearing animals is valued at \$350,000. Most of these are gathered by the employees of the Hudson's Bay Company.

Other important industries carried on in Winnipeg, are the preparation of pickles and vinegar, condiments, baking powder, bag and box manufacture, engraving, electro-plating, brass-founding, soap making, coopering, furniture making. In the province there are also glass works and the fish industry of Manitoba is of great importance (see special article on Fisheries, by Professor Prince). In the neighborhood of the larger towns

poultry-rearing and market gardening form important industries.

We must not neglect to mention other important manufacturing towns and cities of the province. In 1901, the value of Brandon's output of manufactures was \$541,327, and in 1906, this had advanced to \$2,007,995, while Portage la Prairie made the notable increase, in the same period, from \$803,290 in 1901 to \$1,858,000 in 1906. Brandon, the second city in size in Manitoba, has numerous wholesale warehouses, and in addition there are thirty factories. Among the products of these may be mentioned gasoline engines, well-boring machinery, fire and bar fixtures, sashes and doors, pumps and windmills, harness, tents and awnings, cement blocks, mattresses, beer and ale, boilers, bricks, wagons, cut stone and monuments, etc. The Canadian Pacific Railway Company maintains divisional repair shops, employ a large number of men, and the total number employed by the factories exceeds 1,000. The city of Brandon also possesses a crushing plant and sewer-pipe works.

At Portage la Prairie, the chief industries within the town are a flour mill, an oatmeal mill, a wire fence factory, a brick yard, a foundry and a planing mill. This city is the centre of a very important wheat growing district. At Carberry, there is a flour mill with a capacity of 200 barrels daily, and also seven elevators that have a capacity of 180,000 bushels of grain.

At Carman, are located two flour milling plants, and at Dauphin, several elevators and lumber mills. In Gladstone, there is a flour mill with a capacity of 300 barrels daily ; at Grandview, a large saw-mill and sash and door factory.

In the neighborhood of Stonewall, the gardening and poultry industry is carried on to some extent by the German farmers, and within the town are several stone

quarries with a combined annual output valued at nearly \$200,000.

At Rapid City, there are several industries, including a woollen mill, grist mill, brick yard and lime kiln works, besides a flour mill of 175 barrel capacity.

In the near future, thousands of miles of new railways will be constructed in the three prairie provinces alone, new towns and cities are being established almost daily, and large tracts of country are rapidly being brought under cultivation,. Within the next few years, therefore, there is bound to be an enormous demand for all kinds of railway equipment, for every variety of municipal plant, for agricultural implements, and all the vast assortment of manufactured goods required in the building up of civilized communities.

At present, there are no boot and shoe factories in Western Canada,. The total value of these commodities sold annually in the West amounts to \$3,500,000, and in Winnipeg alone, the annual sales of leather gloves and mittens amount, it is stated, to about \$1,000,000. In a country which is largely engaged in stock-raising and in the export of raw hides and skins, it is somewhat remarkable that there are no tanneries, and that leather goods are not manufactured.

Motor cars are used very largely, not only in the cities of Western Canada, but in the country. The first automobile introduced into Winnipeg, was a three-wheeled Knox car, in 1901, and now there are over 300 in the city. These are chiefly of United States manufacture. As a duty of 35 per cent. is charged on imported cars, it seems obvious that these might be profitably manufactured in Western Canada.

Other industries must, sooner or later, be introduced. For example, the utilization of flax fibre, the manufacture of potato starch, the growing of sugar-beets and the manufacture of alcohol, are all obvious possibilities.

When the great extent of Western Canada and its rapid development are considered, it must be apparent that it offers an unprecedented market for the products of almost every conceivable kind of manufacture.

The great distance from large manufacturing centres involving as it does proportionately great freight charges, and the high duty on imported manufactured goods, will compel, ere long, the foundation of a large number of factories to supply even the home demand, to say nothing of the possibilities of an export trade in certain branches. Natural resources are not wanting to supply the necessary raw materials, and the energy and capacity of the citizens of the West ensure the successful establishment and development of numerous home industries.

AGRICULTURE IN MANITOBA

Compiled by The Hon. R. P. ROBLIN, Minister of Agriculture of the
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THE territory now included in the Province of Manitoba, is essentially agricultural in character. A study of the physical features of the country presents many peculiarities indicating its fitness for the production of crops.

Topographically, the Province may be divided into two separate plains or steppes. The first of these extends from the Eastern boundary westward to a ridge known in different regions as Pembina Mountain, Riding and Duck Mountains, and Porcupine Hills. This plain was originally a great lake which gradually receded from its former shores to what is now Lake Winnipeg, leaving Lake Manitoba and a few smaller bodies of water as basins for the drainage from the old lake bed. It is a fertile stretch with a marly clay sub-soil, and a black alluvial surface, the darkness of colour being due, in the opinion of Dr. Dawson, to the frequent burning of grass.

In describing Manitoba, J. Macoun, Dominion Geologist, says:—"High above the Pembina Mountains the steppes and plateaux of the Riding and Duck Mountains rise in well defined succession with southern and western steppes; of these ranges the terraces are distinctly defined, and the north-east and north sides present a precipitous escarpment which is elevated fully 1,000 feet above Lake Winnipegosis, and more than 1,600 feet above sea level."

When viewed from the south and east the Riding Mountains present a peculiar aspect. Close to the ridge, the surface is marshy in many places, but, there are visible, three distinct steppes separated from each other by plateaux of considerable extent. Standing on the edge of the escarpment and looking in the direction of Lake Dauphin, a gulf two or three miles wide and 250 feet deep, are to be seen two ranges of cone-shaped hills, one lower than the other and covered with boulders. These are parallel to the general trend of the escarpment. In some places, they are lost in the plateaux on which they rest; in others they stand out as bold eminences showing the extent of the denudation which gave rise to them. These conical hills correspond to the terraces on the south-west side of the Mountains.

Next in the series come what are known as the Duck Mountains, a high range of tablelands similar, in many respects to the Riding Mountains. This range is entirely cut off from the Porcupine Hills, by the Swan River, which flows in a deep valley between the two ranges; and, on the west from the Great Western prairie, by the Assiniboine River. Proceeding eastwards, these mountains are mostly gently rolling elevations, but, in a few instances, take the form of cone-shaped hills. Where not covered with timber, they are overgrown with a luxuriant and almost impenetrable growth of peas and vetches. From the north-eastern side of the escarpment Lake Winnipegosis is plainly visible 1,000 feet below. Between the north-eastern slope of the Duck Mountains and Lake Winnipegosis, the land in some places is wet and marshy, and will require drainage before it can be successfully cultivated.

The northern portion of the Province, east of the mountain range, is covered, to a large extent, with wood timber. The wooded area commences in the south-eastern portion of the Province and continues in a line

running north-west, striking first the southern point of Lake Winnipeg, then cutting Lake Manitoba about the centre, touching the Riding Mountains at their most southerly point and following north along the western boundary of the Duck Mountains and Porcupine Hills. North of this line the prairie is wooded, and all south of it is bare, with but slight exceptions.

Large areas of the north centre, between Lakes Winnipeg and Manitoba, are interspread with beaver meadows, some of which are of considerable size, reaching from 1,200 to 1,400 acres. Midway between Lakes Winnipeg and Manitoba nearly all the creeks have been dammed by beavers for the purpose of constructing their abodes. These dams have been found to make good wagon roads, and are often used for this purpose by settlers and others. If the dams were cut through the meadows would be naturally drained. Many of these are already dry enough to make good hay lands for settlers.

That portion of Manitoba known as the Red River Valley, extends from the eastern boundary of the Province westward to the Pembina Mountains, a ridge which, at one time, formed the western shore line of the great lake already referred to. The summit of these hills is level for a distance of about five miles, till the foot of another terrace is reached. The summit of the second terrace is level with the Great Buffalo Plains, that stretch westward beyond the Manitoba boundary, and form a fertile tract, once the hunting ground of the Indian, but now the home of thousands of prosperous farmers. Close to the east of the ridge the land is marshy, and this circumstance has in some instances interfered with settlement.

Much of the central and northern parts of Manitoba present a limestone formation, indicated in these regions by out-croppings of large limestone slabs. There are

also large belts of loose, irregular rocks, which are often found so close to the surface as to constitute a serious hindrance to cultivation. The early settlers in Manitoba soon found that the land was admirably suited for the purposes of agriculture. In the Red River Valley, the soil close to the river was found to contain a very high percentage of fine clay, and, although heavy to cultivate, proved to be very fertile. Passing from the river on either side, the soil was found to be more friable. In the north and west beyond the first ridge, the plain, in most places, consisted of a sandy or light clayey loam, capable of cultivation early in the springtime and suitable for the production of crops in a minimum amount of time. Although this region was more northerly than any which had been successfully cultivated in North America, it was found to be eminently productive. Manitoba has approximately twenty-four million acres suitable for agricultural purposes, and about one-fifth of this has so far been brought under cultivation. Owing to the ease with which the prairie land can be broken and cropped, the new settler very quickly makes a home for himself, and often, within eighteen months, has a surplus of grain to dispose of. A hundred years ago the territory now included in the Province of Manitoba was the home of thousands of buffalo. Until the advent of the Canadian Pacific Railway, comparatively few settlers found their way into this country. Those who came had no inducement to grow more than would supply the home market.

The first attempts at farming in the Province were made by the Selkirk settlers, in 1816. This colony numbered two hundred and seventy people, who were chiefly Scotch, sent out by Lord Selkirk, but, later, the settlement included some Irish, French and Swiss. These were intended to colonize the one hundred and ten thousand square miles of land granted to Lord Sel-

kirk, by the Hudson's Bay Co. Each of the settlers bought one hundred acres for which he agreed to pay one dollar and twenty-five cents per acre. The farms were from six to ten chains wide and ran back from the river front about two miles, and were hence often referred to as "lanes." This kind of subdivision, however, had its advantages; the river, which was the principal highway, was close to all settlers, and enabled them to secure an abundant supply of water and fish. This system of survey also made the settlement more compact, and hence was safer in times of danger. The settlers congregated around Fort Douglas, sowed in the spring of 1816 a few bushels of wheat and barley, and planted a few pecks of potatoes. From this first crop the returns were excellent, wheat yielding 40, barley 50, and potatoes 100 fold. The grain was cut with a sickle or cradle and was threshed with a flail, and the "Quern" or hand stone was used to crush the grain into flour. In 1817, the settlement was called Kildonan, after the native parish of the Scotch settlers. From 1818 to 1821, the crops were more or less destroyed by grasshoppers, and in 1820, there was no seed grain whatever in the settlement. In February, 1821, a party was formed to bring 250 bushels of wheat from Prairie du Cluën, in the United States. This grain cost \$2.50 a bushel at the place of purchase, but yielded well in the fall of 1821, and was all kept for seed the next year. The first importation of cattle took place from the United States, in 1822, when the prices paid were \$150 for a milch cow, and \$90 for an ox. A few ploughs were in use in 1823, but most of the settlers still used the hoe and spade. About this time the two-horse tread-mill for grinding wheat was introduced, followed later by a Hudson Bay windmill, at Fort Douglas. A slight check was given to agriculture by the flood of 1826, but the supply of grain soon exceeded the demand, and a large stock was left

over each year. The Hudson's Bay Company could purchase only eight bushels of wheat from each farmer, and four bushels from "trip" men, the price paid being 87 cents per bushel. The settlers, however, were able to raise, even with their primitive implements, ten times as much as they could sell.

In 1816, Lord Selkirk endeavored to assist the settlers by establishing an Experimental Farm, his ambition being to improve the breeds of cattle and horses, and to increase the yield of grain and dairy products. The Hudson's Bay Company also started an Experimental Farm about 1830, near Upper Fort Garry. Good buildings were erected and animals of the best breeds were imported, among them being a fine stallion from England, at a cost of \$1,500, and also a number of mares. These excellent animals greatly improved the breed of horses in the settlement. In 1832, a company was formed for the purpose of breeding large herds of cattle, for the sake of their hides and tallow, but owing to bad management, the enterprise failed. A few years later efforts were made to grow flax and hemp on a large scale, but, although these grew well, labor was too scarce to make the venture profitable. According to the census of 1849, the live stock in the country had increased to nearly 13,000, and over 6,000 acres were under cultivation. After the first Riel rebellion, settlers came pouring into the country and the acreage under cultivation increased rapidly. It is difficult at this distance of time to speak positively in regard to the first varieties of wheat used but thirty-five years ago there were two varieties in cultivation—an early stiff-bearded variety not very productive, and a beardless kind having a hard red kernel, rather longer than Red Fyfe, and apparently of good milling value. The last mentioned was grown on the Brandon Experimental Farm for some years under the name of the "Old Red River Wheat."

About 1877, the Golden Drop Wheat was grown extensively by some of the best farmers. This was a very fair wheat but somewhat soft, and inclined to smut badly. About 1880, the famous Red Fyfe Wheat was introduced into the West, a variety supposed to have originated on the Baltic coast. It is very productive, has a healthy, vigorous plant, the berry being hard and bright, the bran thin, and the gluten contents high, making its milling qualities unequalled. This variety has done more to keep up the reputation of the Province as a wheat-producing country than any other, and the greater proportion of the wheat exported is of this sort.

On the establishment of the Dominion Experimental Farm in this Province, in 1888, an effort was made to introduce new varieties of early ripening wheat for sowing in the more northern parts of the country. The first to be tested was imported from northern Russia, and was called Ladoga. This was an early variety, but the quality was not equal to the requirements of the country. Later, Dr. Wm. Saunders, Director of the Experimental Farms, introduced several cross-bred wheats, such as the Preston and Stanley. These have been grown with more or less success in the less favoured parts of the country, but are not to be recommended in preference to the Red Fyfe, where that variety can be ripened successfully.

The acreage sown with barley in Manitoba is increasing very rapidly. Within six years the area occupied by this useful grain has doubled. The results of many years' experience show that the Chevalier varieties of two-rowed barley have not succeeded well. The ear seldom fills perfectly, and every year these varieties are more or less lodged, and they are late in maturing. The two-rowed sorts of the Duck-Bill type, such as Canadian Thorpe, are much stiffer in the straw, and generally speaking, the heads fill well. The six-rowed varieties

are those best adapted for general cultivation. They ripen early and can be sown later than other grain, and even then will mature early enough to escape injury from autumn frosts. The straw is nearly always stiff and bright, and the ears well filled. Of these varieties the Mensury and Odessa are excellent. The average yield of Mensury barley on the Brandon Experimental Farm, for the five years ending 1907, was 63 bushels and 40 pounds per acre. Odessa gave an average return of 64 bushels and 40 pounds per acre for the same period.

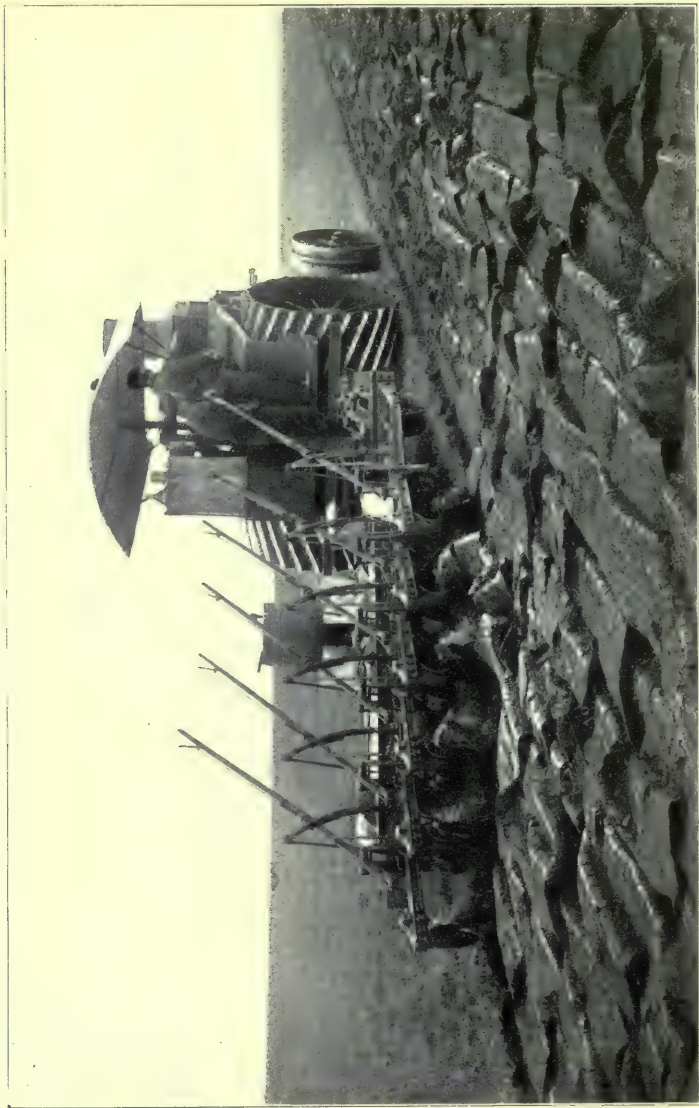
Barley is largely grown as a cleansing crop. The method is to spread barnyard manure on the stubble in spring, ploughing it under and sowing about the end of May. This practice gives a good crop and the land is left comparatively clean and ready for wheat the following year.

The yield of oats is usually very satisfactory throughout the Province, when proper care is given to their production. Although not so important as wheat, the sale of this grain for oatmeal and feeding purposes is increasing each year, and the price obtained is higher than in former years. A fairly pure and clean sample of heavy Manitoba oats is looked upon with much favor by oatmeal millers throughout the Dominion, and finds sale at remunerative prices. In some districts of this Province, where the soil is better adapted for oats than for wheat, that grain is grown almost exclusively. By careful selection of seed, and thorough cultivation, immense yields are obtained, and many farmers report an average of eighty bushels per acre over their entire farms. The "Banner" oat has been the favourite for a number of years. This is a thin, hulled sort, of excellent quality, and very productive. Other valuable varieties are "Abundance," "Ligowa" and "New-market." These are all white oats, and sell at a good

figure for milling purposes. The place occupied by oats in the rotation of crops is usually after wheat and just previous to either a barley crop or summer fallow. For this reason the returns per acre are not as large as they otherwise would be. On the Experimental Farm at Brandon, on summer fallowed land, without fertilizer, the average yield of "Banner" oats for the five years ending 1907, was 116 bushels and 4 pounds per acre. This is an indication of what can be accomplished on our rich soils with good cultivation.

In the newer settlements there is an abundant supply of natural hay on the lower lands and water meadows. For some years, this supply will be sufficient for all demands. Later, when these lands are drained and turned into grain fields, the farmer will be compelled to look elsewhere for his supply of hay.

Fortunately there are many varieties of cultivated grasses and other fodder plants, that give profitable yields in this country. The most popular grass is "Timothy;" this excellent grass is grown most extensively on the more moist soils of the Province, and returns on such soils are exceedingly good. Where "Timothy" fails to give large returns, Western Rye grass is grown with profit. This is an excellent native grass and is now extensively cultivated. In other districts where the soil is light "Austrian Brome" is grown with good results. Among the annual fodder plants the following are cultivated with success:—German, Japanese and Common Millet, Broom, Corn and Hungarian grass; these all give excellent returns of useful hay. Although Indian corn is not grown for the grain, it is a decided success here as a fodder plant. When sown about the middle of May it grows rapidly during our long bright days, and soon reaches a height of from 8 to 10 feet, the yield often amounting to from 15 to 20 tons of green fodder per acre. This is either made into



Breaking the Sod with a Steam Plough. Western Canada.

ensilage or stooked in the fields until required for feeding. Whether used as fodder or ensilage it is excellent for fattening cattle, and is one of the very best foods for milch cows.

In all parts of the Province where the original prairie sod is thick and tough, it is customary to "break and back-set," but where the land is covered with small trees and scrub, breaking and back-setting is not necessary. The breaking of new prairie is best accomplished with the hand breaking plough, having a rolling coulter, but fairly good work can be done with a sulky plough if the land be very smooth and level. For the best results the breaking should be shallow, and the work completed by July 1st. A few weeks after breaking the sod will be rotted and the land should then be "back-set." This is carried out by ploughing in the same direction about two inches deeper than previously, thereby bringing up some additional soil for a seed-bed. After "back-setting" the land must be made as fine as possible with a disc-harrow or some other similar implement. If this plan be adopted only a light harrowing will be required when the land becomes seeded in the following spring. In some parts of the Province, the land is too rough to permit of thin breaking. In such districts, the land should be ploughed from 4 to 5 inches deeper than in the smoother lands, and as early as possible in the year. It should also be well harrowed in order to level the surface. In such cases a second ploughing is not necessary, but the ground must be again harrowed the following spring, before the grain is sown.

A considerable portion of the best land in Manitoba is covered with small timber and scrub which, when cleared, produces magnificent yields of all kinds of farm produce, and the work of clearing is very light when compared with that of preparing the heavy timbered land of other countries. The method of clearing such

lands is just to chop out the larger poplars and willows during the winter. A fire is then run over the land in order to burn the remaining portion of the scrub. After this the ground may easily be broken with a strong brush plough; all the additional levelling can be accomplished with a disc-harrow or other similar implement. The land is then ready for seeding, and usually yields large returns. Immense areas of this class of land are still open for settlement, principally in the northern part of the Province, and can be obtained either as free homesteads or for a nominal price.

The larger proportion of the wheat crop of Manitoba is grown on land that has produced a grain crop of some kind the previous year. The stubble land is ploughed in the autumn as early as possible; the land is then harrowed and sown in the following spring. This system is very inexpensive, and, when the land is new and the seasons favourable, the profits are large and immediate. But this exhaustive plan cannot be retained for any great length of time. Sooner or later a regular system of rotation has to be adopted. A common practice is to include a season's summer fallow in the rotation, and the most approved plan for this operation is to plough the grain stubble in June, just as soon as the weed seeds have begun to germinate. The soil is then "compact-ed" with either a "sub-surface packer" or other similar implement, and this proceeding is followed by thorough surface tillage during the summer, in order to kill weeds and prevent evaporation of soil moisture.

Summer fallowing is practiced in Manitoba by most farmers, its frequency depending on the character of the soil and other conditions. Some of the largest and best crops of wheat are obtained after this treatment, and the condition of the soil is greatly improved at the same time. During recent years the more advanced farmers have included the culture of grass in the rotation. The



Harvesting in Manitoba

usual practice is to sow either Timothy or Western Rye grass with a "nurse crop;" to cut it for hay during the two following seasons, then to pasture for the third. This plan furnishes both hay and pasture for the farm, gives the land certain rest and so fills the surface with root fibre that soil drifting is prevented. At one time it was thought that none of the clovers would thrive in Manitoba, but, by practicing improved methods of cultivation, all the perennial and biennial species are found to be just as hardy and productive as in the eastern provinces. The fact that these leguminous crops can be grown suggests great possibilities for the agriculture of the West. To prove successful on the majority of farms in this country, clover of all kinds should be sown without a "nurse crop" of grain, although, in very favorable seasons, a very light seeding of grain may be permissible if cut early for green feed. In growing red clover excellent results have been obtained by ploughing grain stubble in spring, harrowing once, then sowing about 12 pounds of clover seed per acre, harrowing a second time and rolling. When the weeds and "volunteer crop" of grain are about a foot high, a mower should be run over the land and the cuttings left on the ground to act as a mulch. By this plan the clover plants become large and well rooted before autumn, and there is no danger of winter killing. Two cuttings of clover can be gathered in the following year.

In this country where large areas of land are cultivated, it is necessary that all farm operations be expedited as much as possible. For this reason the most improved machinery is on use on all the up-to-date farms. As soon as the grain is fairly ripe, large grain-binders are set to work, and kept constantly in operation from dawn to sunset. Sometimes a score of these large machines, each drawn by four horses are found following each other closely around one immense field, and

in a few days, hundreds of acres of ripe grain are safely in the stook. The grain is allowed to cure for a few days, after which large threshing outfits, consisting of powerful steam traction engines and separators, are brought into the field where the threshing is done directly from the stook, and so quickly that only a few days intervene between the ripening of the grain and its delivery on the market. At the present time the prospects for agriculture in the Province are bright; the prices of farm products are high, the area under cultivation is increasing rapidly, and the employment of improved conditions of agriculture should result in larger returns than in former years.

THE LIVE STOCK INDUSTRY OF MANITOBA

In the early days of the settlement of Manitoba, Live Stock was considered the mainstay of agriculture, for some little time was necessary to enable the settlers to discover the possibilities of soil and climate for the production of wheat. Many of the early pioneers brought with them a foundation stock, and in not a few of the best studs and herds of to-day can be traced a descent from those early importations. Needless to say, the stock imported from the older provinces thrived wonderfully on the nutritious prairie grasses, which for many generations had sustained vast herds of buffalo. The pioneer delights to recall the big steers he produced when the herds fed on the short sweet upland pastures or revelled belly-deep in vetches and wild pea-vine. An opening having been made for the export of wheat by the completion of the railroad between the prairies and the lake ports, the wealth-producing possibilities of grain growing were quickly recognized. It happened

that the open prairie was easily brought under cultivation. No expensive equipment was required, an easy credit system prevailed, wonderful returns were obtained, and settlement rapidly increased. As a result the live stock interests were neglected, and wheat became the one thing considered worthy of attention.

Many a traveller has marvelled at the myriad beacon fires that illuminate the autumn sky from the far-reaching stubble fields, where the straw piles are burned as soon as the threshers have completed their task. This improvident waste, coupled with careless methods encouraging the introduction and spread of weeds, is causing the pendulum to swing slowly back again. In order to improve the mechanical condition of the soil, to restore exhausted fertility, and to control noxious weeds, grasses and clovers are being introduced, farms are being fenced and the rearing of live stock is again receiving serious attention.

The following figures, taken from Government statistics will give some idea of the growth of the live-stock industry:—

Year	Horses	Cattle	Sheep	Swine
1881	16739	60281	6073	17358
1891	86735	230696	35838	54177
1901	163867	349886	29464	126459
1907	215819	521112	28975	200509
1908	230926	531544	29265	192489

The demand for horses is still greater than the local supply. For a number of years, horses have been shipped into Manitoba from the Eastern provinces, the Western ranges, and from the States to the South. During the past year, however, Manitoba-bred horses, mostly for farm purposes, are beginning to appear in considerable numbers on the Winnipeg market. The

keen demand which exists, and the good prices obtainable, are stimulating the breeding of horses. In addition to several breeding studs which have been established, many farmers are procuring good brood-mares, not a few of which are registered mares of the draft breeds. For many years a considerable business in the importation of stallions has been carried on. Importers from the United States have not only brought with them American-bred stallions, but have also introduced their methods of disposing of these. One of the methods referred to is commonly known as "syndicating." Ten or a dozen farmers are induced to take shares in a stallion, signing joint notes therefore. In many of these cases, the stallion so disposed of is stated to be worth from \$2,000 to \$4,000, which is generally three or four times its actual value. The notes are of course discounted before maturity, and the salesmen decamp. Such practices have done much injury to the horse-breeding industry but happily they are now almost a thing of the past. Several large dealers, permanently established in the West, import direct from Great Britain, and Ontario dealers may now be expected to take greater interest in supplying Manitoba with good home-bred and imported stock horses.

Legislation has been introduced by the Western Provinces to encourage horse-breeding. The object of such legislation is educational, and the intention is to encourage the use of sound, pure-bred stallions, and to eliminate the unfit. Owners are compelled, under a penalty, to register stallions with the Provincial Departments of Agriculture; certificates are then issued stating whether the animal is pure-bred, or graded, soundness, or the reverse, also being indicated. A copy of this certificate must then be printed on all advertisements and route-bills, which must be conspicuously posted on the door of every stable occupied by the horse

during the breeding season. By this means the farmer is enabled to know the breeding value of the stallions he employs.

The draft breeds are undoubtedly the most popular with the farmers, and of these, the Clydesdales, take first place. A few Shires have been introduced, and, during the past few years, a good many Percherons. The latter would appear to be slowly gaining in popularity. As there are, however, many registered Clydesdale mares throughout the country, and in nearly every section, a good representative Clydesdale stallion, this breed is likely to hold its own for a long time to come. Of the horses bred on the average farm, few would scale up to the "draft" class, the majority having to be classed as "agricultural" horses, weighing less than 1,600 lbs., while there are many horses bred from small nondescript mares that could only be classified as "farm chunks," a useful enough horse on the farm, although lacking in weight, but hardy, and generally with good wearing qualities.

Of the lighter breeds, comparatively few are bred, although there are many American trotting stallions in the country and some excellent road horses are produced. These are always in good demand, provided they possess sufficient size and quality. Thoroughbreds, Hackneys and some of the Coach breeds have been introduced in various parts of the Province but, so far with little marked effect upon the horse industry. Some saddle and heavy leather horses are produced, but most of these crosses are what may be called "General Purposes" horses. This is a good, useful class, fit for all kinds of light farm work and for certain kinds of road work, but it will not command high prices in the market.

The country on the whole is well suited for horse breeding. The climate is healthy, and feed of good

quality is abundant. There are, however, some difficulties to contend with. The most serious of these is, perhaps, the mortality among foals, from the disease known as "joint ill," and other little understood pathological conditions, which are attributed to insufficient exercise on the part of the mares during the long idle winter season. Another disease, which is confined to the lower-lying districts of the Province, is commonly known as "swamp fever," an intermittent fever of a low type, not as yet thoroughly understood.

The cattle industry has advanced with the settling of the country, and, with improved market and transportation facilities, will doubtless become one of the most important branches of agriculture.

Manitoba cattle are of a healthy breed, and cost little to keep, for there is everywhere an abundance of suitable fodder. On the smaller farms (and most of those in the extreme eastern and north-eastern portions of the Province, come under this category) cattle of the dairy type predominate. By this it is not meant that the special dairy breeds are exclusively used, as most of the cattle in these sections, as well as throughout the province, show more or less of Shorthorn strain.

The little Red River cow of earlier days, rugged, vigorous, big middled, short-legged, crumple-horned, line-backed or brindled., has almost entirely disappeared. The foundations of several herds of Shorthorns were laid in the early eighties, and the progeny of these, and of many subsequently established, have been widely distributed throughout the country. The blood of this cosmopolitan breed now flows in the veins of nearly all our cattle. Other breeds have been introduced, but still the Red, White and Roan numerically holds supremacy, and at all leading Exhibitions outnumbers other breeds in the proportion of two to one. There are now in Manitoba over 350 members of the Dominion

Shorthorn Breeders' Association, and their favourite breed of cattle seems in no immediate danger of losing in popularity. Breeders should, however, endeavor to revive the milking qualities of the breed in order that it may continue to hold the position of "Farmers' cow."

Of the special "beef breeds," the Hereford and the Aberdeen Angus are fairly well represented, and a number of good breeding herds exist. Where the calves run with their dams, and beef-production only is desired, either of these breeds, or the Galloway, thrive abundantly. They are good grazers and feeders and mature heavy, compact carcasses of beef of the best quality. The females, however, are not so useful as "Farmers' cows," since they are not such good average milkers nor as docile as the Shorthorn.

Of the dairy breeds, the Holsteins seem to be steadily gaining in favour. They are robust and large-framed, with great capacity for the assimilation of "roughage," and produce immense quantities of milk of fairly good quality. There are several excellent pure-bred herds in the Province. The Ayrshire and the Jersey, have their fanciers, and small herds have been in existence for a good many years. The last named breed has made no headway, but the first is numerously represented in the dairy districts, and vigorously contests every inch of ground with her big black-and-white sister.

Year by year, furrow by furrow, wheat has crowded back the herd from the sweet grasses of the upland prairies on to the lower-lying flatter lands, where the grasses grow coarse, sedgy, and less nutritious. Under such circumstances, cattle have suffered some deterioration, but with the introduction of more "intensive" methods, including the growing of corn, clover and alfalfa, with greater attention to sanitation of stock and the adoption of less laborious methods of feeding, better results will accrue to the pro-

There are already indications that cattle-feeding will be carried on more extensively in this Province. The straw and chaff and screenings of the wheat farms will "be marketed on the hoof" and the manure thus created will restore the fertility and improve the mechanical condition of the soil, resulting in better yields of superior quality, and hastening the maturing of the crops. As in the corn belt of the States, the cattle from the ranges of the West will be "finished" on their way to the world's markets, on the wheat farms of Manitoba and Saskatchewan.

It is sometimes said that swine-breeding on any extensive scale cannot be profitably carried on except in conjunction with dairying, or under such conditions as exist in the corn States to the South. To a certain extent, that is true. Every farmer can, however, at a minimum expense, even without milk, produce a few hogs on by-products that would otherwise be wasted. It is necessary, however, to raise the hog in a cheap way, making him utilize pasture grass, rape, roots and "roughage," and then finish quickly on "concentrates." At the present time there is not sufficient pork produced in the West to supply the local demand, but, as previously indicated, the market conditions are not such as to encourage the industry. The demand being for light, mild-cured bacon and hams, the bacon type of hog is preferred to the lard type, consequently the two great bacon breeds, the Yorkshires and Berkshires, have virtually taken possession of the trade. A few Tamworths are also bred, and their impress may be noticed in the Stock Yards. One or two small herds of Chester Whites and Poland Chinas are also maintained in the Province, but they are not kept in sufficient numbers to affect the general type of the market hog.

Sheep-breeding in the Province has been losing ground for the past fifteen years. This is not due to unsuitable

conditions of climate, for sheep thrive remarkably well in this clear, dry atmosphere. Neither is this condition of the industry attributable to unfavourable markets, for prices for lambs and mutton—sheep of any kind—rule high. The market is supplied from the ranges of the West, from Ontario, and the Maritime Provinces, and even frozen mutton from Australia has found its way into the Winnipeg market. The one great enemy of the shepherd in the West is the coyote or prairie wolf. While governments and municipalities offer bonuses for wolf scalps, the breeding grounds of the wolves are so extensive, stretching as they do into the Northern wilds, that the only immediate remedy against their depredations would seem to be the protection of the flocks by means of fences. Provision of this nature will undoubtedly be provided ere long by many farmers. Flocks of many of the leading breeds have been established. Any of the medium woolled breeds are suitable. The Shropshires and the Oxfords have proved popular and useful, especially for “grading up” the common merino-grade range ewe. Leicesters are also strong favourites and have made conspicuously good exhibits at our leading exhibitions.

Early in the live-stock history of the province, active Associations were organized, and through the agency of these, public interest has been stimulated in the important work of live-stock improvement. Valuable concessions in regard to freight rates for pure-bred stock have been obtained from Railroad Companies. Exhibition Associations have been induced to employ more efficient judges and to provide larger prizes and more adequate accommodation for live-stock. Provincial auction sales of pure-bred stock have been inaugurated, and farmers have thus been enabled to select bulls for breeding purposes, from among the consignments of many breeders.

Within the last year or so a very successful Winter Fair, Horse Show and Fat Stock Show has been established at Brandon, under the auspices of these associations, where practical demonstrations in live stock judging are given and lectures delivered on various phases of the industry.

DAIRY INDUSTRY IN MANITOBA

Careful consideration of the past and present conditions of the Dairy Industry in Manitoba, justify a feeling of optimism as to its future. Although this industry is still in its infancy, it has made steady progress as a reference to the following table will show:

Average annual yield and value of butter and cheese by five-year periods.

Periods	BUTTER			CHEESE			Total Value
	Pounds	Value	Av. price	Pounds	Value	Av. price	
1896-1900	2,690,923	\$ 377,964.73	14 cts.	928,587	\$ 84,290.60	9 cts.	\$ 462,255
1901-1905	4,301,173	\$ 722,336.78	16.8	1,277,772	\$ 117,267.44	9.1	\$ 839,603
1906-1907	5,533,769	\$ 1,115,543.38	20.1	1,455,020	\$ 182,120.85	12.5	\$ 1,297,664

While this table fairly represents the growth of the industry, it does not indicate either its magnitude or its value to the Province, since it does not take into account the town and city milk and cream supply and the "by-products" fed at the farm. When it is remembered that the town and city population constitutes somewhat more than fifty per cent. of that of the Province, it is readily seen that there is a large quantity of milk and cream consumed as such. The columns of average prices, given in the foregoing table, are quite as worthy of note as those indicating the growth of

the industry, since they point to the growing demand for dairy products at increasingly remunerative prices.

Our native and cultivated grasses are both suitable for the production of a fine quality of milk, suitable for the making of excellent butter or cheese. We can grow in abundance, suitable soiling crops for supplementing the pastures when necessary, such as peas and oats, alfalfa (in many parts of the province), and corn. Furthermore, we can successfully grow such crops as mixed hay (clover and timothy), brome grass, alfalfa, corn, roots, and the coarser grains for fall and winter feeding. With the right kind of cows, properly cared for, no trouble is experienced in the production of milk economically and in quantity.

The beef breeds of cattle, particularly Shorthorns, predominate in the Province. These were introduced in the early days when every farmer was surrounded with all the grazing land he desired. Later, as the country became more generally cultivated, dairying was combined with beef production, and, as a result, particularly amongst the Shorthorns and Shorthorn grades and crosses, many very creditable and even excellent general or "dual-purpose" cows, whose milking qualities have been developed by careful selection. In addition to these there are, in the Province, several excellent pure-bred herds, representative of the Holstein, Ayrshire and other dairy breeds. The Holsteins probably being, at least in so far as numbers go, in the ascendancy. Many good dairy grades are also to be met with.

A very considerable portion of the Province, particularly in the east and north, is much more suitable for mixed farming than for grain growing. Even the present grain districts cannot sustain indefinitely the continued impoverishment resulting from the continual production of grain crops. Continuous grain-

growing has additional bad result of increasing the number of weeds. To restore and maintain soil fertility, and to eradicate weeds, the adoption of a suitable rotation of crops is imperative. Along with this would naturally be introduced a certain amount of stock-rearing. Thus dairying would in due course occupy a prominent part in any thoroughly satisfactory scheme of farming. The present conditions of the dairy market are encouraging, the home market especially is rapidly developing.

One feature of the Manitoba dairy industry is the extent to which the manufacture of butter and cheese has become co-operative. Although the Province is yet sparsely populated, fully fifty per cent. of the butter and cheese put upon the market is made in factories.

There are in the Province about forty cheese factories, situated in the more thickly settled districts. But there is greater scope for butter-making and cream gathering.

There is at the present time, a marked tendency towards the centralization of the creamery industry. This is encouraged by the co-operation of the Express Companies, who give reduced rates on cream for butter-making purposes. This system has its advantages, and its disadvantages. Among the former are a larger output, better equipment and a more economical production: while among the latter may be mentioned a lack of interest on the part of the producer in the scientific work of the creameries.

HORTICULTURE IN WESTERN CANADA

In considering the agricultural possibilities of the Province of Manitoba, the subject of horticulture is too frequently overlooked or given scant consideration. The fact that cereals can be grown with splendid success has been very clearly demonstrated, but up to the

present time comparatively few of the people residing in Western Canada, have had sufficient confidence in the fruit-growing possibilities of the country to enter into the industry on a very extensive scale. However, a few pioneers have paved the way and to the results of their work we look for encouragement and guidance.

In a country of such rich agricultural resources as Manitoba, where excellent crops of cereals can be produced on an extensive scale with a minimum amount of labor, one would naturally expect that the people would turn rather slowly to the production of fruits which require much greater care and a much more "intensive" system of cultivation. The growing of this finer class of agricultural products is usually delayed until the country has become thickly populated and the land has been brought into a fairly good state of cultivation. Making an allowance for the difficulties which have to be overcome in the production of fruits, some splendid work has been done and substantial progress made. Attempts in fruit growing have been made since the first settlement of the country. The first experimenters were greatly handicapped by a lack of information regarding the suitability of the country, and many mistakes were made. The introduction of tender varieties was attended with failure, and it was only at considerable personal expense that the early growers learned that only the hardiest fruits obtainable were suited to this rigorous climate. Since this lesson has been learned steady progress has been made. Experiences have resulted in great efforts to secure hardy varieties of apples, plums, cherries and other fruits from countries where the climatic conditions are similar to those of Manitoba. The Experimental Farms have given splendid assistance in this work and have been instrumental in introducing some fruits that undoubtedly will be of great value in future years.

Among the valuable introductions is the *Pyrus Bacata* or Siberian Crab Apple, which was first planted on the Experimental Farm at Brandon, in the year 1890, the trees having been grown at the Central Experimental Farm, Ottawa, from specially selected seed that had been imported from Russia. The introduction of this hardy Russian apple has done much for the advancement of apple growing in Manitoba. It furnishes a hardy stock on which the tenderer standard varieties may be grafted and their hardiness very much increased. Dr. Saunders, Director of the Central Experimental Farm, Ottawa, has also endeavoured to increase the hardiness of some of the standard varieties by hybridizing them with the *Pyrus Bacata*. Several promising hybrids have been produced in this way and are now being grown to some extent in the Province.

Among the earliest attempts in fruit growing in the district of Winnipeg, may be mentioned those of the late Mr. W. B. Hall, of Headingly. In the early sixties some not unsuccessful experiments were conducted by him with currants, tomatoes, gooseberries, Siberian crab apples and rhubarb. The results were indeed so satisfactory that he and others in the neighborhood were induced to carry on fruit growing on a large scale. Among other pioneers whose experiments on fruit growing have been of value, may be mentioned the late Mr. Thomas Frankland, of Stonewall, and Mr. A. P. Stevenson, of Dunstan. Mr. Stevenson has experimented very largely with plums, cherries, grapes, gooseberries, currants, raspberries and strawberries, and his untiring efforts in this direction have been a great incentive to others within the province to interest themselves in the growing of fruits. His work, together with the work that has been done on the Experimental Farms, has demonstrated very clearly that hardiness is one of the first essentials of a fruit suited to the Province of Manitoba. From

the time of the introduction of the crab apple and the hardy Russian sorts may be said to date the first successful attempt at apple culture in this province.

The Experimental Farm at Brandon, under the direction of Mr. S. A. Bedford, has done a great deal for Manitoba horticulture. Hundreds of varieties of the various classes of fruits from different parts of America and Europe have been tested there and the results published. In the month of April, 1899, about five hundred fruit trees, consisting of apples, crabapples, plums and cherries, were placed under test at the Experimental Farm. These included many of the large standard varieties together with a number of hardy imported kinds. Numerous varieties of grapes, currants, gooseberries, raspberries, blackberries and strawberries were also tested. Many of these trees did not survive the first winter and in a few years only the hardiest sorts were found to be alive. Since the first planting, many other varieties of fruits have been introduced and experimented with and much valuable information has been gained. Among the numerous introductions was the Russian-Berried Crab *Pyrus Baccata*. Its extreme hardiness makes it eminently suitable for this country. It is used as stock on which the less hardy standard sorts are grafted, for the purpose of increasing their hardiness and thereby adapting them to an environment that would otherwise be uncongenial to them.

Small-fruit culture in the Province of Manitoba has always been attended with a very fair degree of success. Currants, gooseberries, red and black raspberries, and strawberries have been grown since the early settlement of the country. They yield profitable returns when intelligently cultivated. They apparently possess an inherent hardiness not shared by many tree-fruits, and this renders them much more suitable for the severe climate. It is only a matter of a few years until these

smaller fruits will be grown in all parts of the Province, in sufficient quantities to supply the local demand. Another phase of horticultural work to which considerable attention is being given, is the decoration of home and school grounds by the planting of ornamental trees, shrubs and flowers. The prairie is bare and unattractive and round many prairie homes there has been a lack of trees and shrubs. The work of beautifying the surroundings of residences is the most necessary step in the horticulture of the Province of Manitoba, and a great deal is being done in the cities, towns and rural districts to increase their attractiveness by ornamental planting.

In regard to the growing of vegetables the Province occupies a splendid position. Practically all garden vegetables with the exception of a few that require a long season, may be grown to a high state of perfection. The richness of the soil and the shortness of the seasons tend to give a flavour and tender crispness not attainable elsewhere, to the vegetables.

The splendid yields that may be obtained from these fertile fields make vegetable growing a very profitable branch of agriculture, as there is an abundant demand in the home market.

The work of fostering the cause of horticulture within the Province is carried on largely by the Agricultural College and certain societies; among these are the Western Horticultural Society, the Brandon Horticultural and Forestry Society and others of a more or less local character. The objects of these societies are to bring together those persons interested in horticulture, to gather together horticultural literature and to stimulate in every possible way a greater interest in horticultural pursuits. Much good work has been accomplished by these societies and to their efforts is largely due the in-

creasing interest that is being taken in the various lines of horticultural work within the Province.

There are several directions in which progress may be made in Manitoba horticulture; for example, a better selection of varieties; an improvement by breeding and selection of wild and native fruits and varieties grown in the country; and by improved systems of culture. Much is being done in plant improvement, and the Province of Manitoba offers an excellent field for the improvement of native fruits. Various wild fruits grow very abundantly in many parts of the Province, and if a combination could be effected whereby the hardiness and productiveness of these could be combined with the larger size and better quality of the cultivated fruit, a great step in advance would be achieved.

POULTRY RAISING

The possibilities of the poultry industry in Manitoba are just beginning to be understood. When the country becomes more thickly populated and mixed farming is more generally practiced, poultry raising will no doubt occupy a prominent place on the farm. To many people living in small towns in Manitoba, a flock of hens is sufficiently profitable to be a source of considerable income. The question is sometimes asked: "Is the return likely to be sufficiently great to render it worth while to devote one's entire energies to the rearing of poultry?"

The best reply to this question may be deduced from the following facts:—

From the Province of Ontario and the Northwestern States, over one million pounds of dressed poultry, having a value of at least from \$150,000, were imported into Winnipeg for its own consumption during the past winter. From the same districts no less than 4,500,000

eggs, of a total value of about \$100,000, were brought into the city during the winter. Thus we see that the City of Winnipeg with 130,000 inhabitants imports for its own consumption about \$250,000 worth of poultry and eggs each year. To these figures must be added the amount imported for Brandon and some of the other larger towns.

The above mentioned values of poultry products imported into the Province are so great that the industry ought to be a good investment. It has been estimated that in the neighborhood of Winnipeg alone, there are openings for about fifty poultry farms. A serious drawback to profitable poultry keeping in Manitoba is the extreme cold during some of the winter months. But since the air is remarkably dry this disadvantage may easily be exaggerated. It is, however, necessary that adequate protection should be afforded the poultry during the severe weather.

MARKETS AND MARKETING

Co-incident with an increase in the area of cultivated land, improvement has been made in the organization of systems of marketing farm products. In no particular is this more apparent than in the building up of the grain trade of the West. Primarily, a grain-producing country, her whole prosperity bound up in the annual product which a bounteous nature gives her, it is but natural that Manitoba should find the business of handling the crops, so as to bring them to the various markets of the world, a task of the first magnitude. This is no less urgent a duty than the actual production of the crops.

Six different railway companies now run trains to Winnipeg. These give complete connection with every part of the continent, and their branches radiating to

all parts of the West make it easy for the farmers to transport their products to the world's markets. By statutes of the Canadian parliament, all inspection certificates for grain or other products that come under inspection in Western Canada, must be issued by inspectors in Winnipeg. The Western crop of 1908, was estimated at over two hundred and thirty-six million bushels, about eighty-five per cent. being marketed for export. All of this amount passed through Winnipeg and went out bearing Winnipeg Inspection Certificates. Of the total Western crop Manitoba produced 113,058,189 bushels of grain, nearly one-half of which was wheat. From the crop of 1909, Winnipeg grain dealers will handle enough bread stuffs to furnish a year's supply for all the inhabitants of Canada, and 10,000,000 people besides.

For the handling of this grain, there are in Western Canada, 1,416 elevators and 41 warehouses with a total capacity of 43,037,000 bushels. Most of these are situated on the Canadian Pacific or the Canadian Northern Railway. In the Province of Manitoba, on the Canadian Pacific Railway, there are 462 elevators and 12 warehouses with a total capacity of 14,574,600 bushels, while on the Canadian Northern in the same Province there are 205 elevators and two warehouses having a total capacity of 5,921,000 bushels. Besides these elevators, at every station there is built a loading platform over which a farmer may load grain from his wagon direct to the car, thus allowing him to ship his grain independent of the elevator companies. During the marketing of the crop of 1908, about 33 per cent. of the grain was shipped in this way.

The marketing season usually begins early in September, and a great bulk of the grain is disposed of before December. All the grain handled in this space of time is reloaded at the lake ports, Fort William and Port

Arthur and shipped by lake. At these points thirteen elevators, classed as "terminals," are owned and operated as follows:—

At Port Arthur, Ontario, the Canadian Northern Railway owns two, with a joint capacity of 7,000,000 bushels. These are operated by the Port Arthur Elevator Company. There is also at Port Arthur, the elevator of Jos. G. King and Company, with a capacity of 800,000 bushels. This elevator is on the line of the Canadian Pacific Railway. At Fort William, the Canadian Pacific Railway owns and operate three, with a respective capacity of 2,258,000; 2,209,700 and 1,221,000 bushels each. Four other elevator companies have storage capacity amounting to 2,360,000 bushels.

At Keewatin, Ontario, the Lake of the Woods Milling Company have two milling elevators having a capacity of 700,000 and 500,000 bushels respectively. And at Kenora, the Maple Leaf Flour Mills Company own one that will store 500,000 bushels.

The greater portion of the grain taken into the hundreds of smaller elevators in the West, and shipped from loading platforms at country points, finds its way into the above mentioned terminals at the Lake front and is shipped from there to its ultimate destination, the bulk going by vessel to Georgian Bay ports, Montreal and Kingston, although last year close on to 9,000,000 bushels went to Buffalo and other United States ports. In addition, 1,571,940 bushels were shipped in 1908, by rail over the Great Northern Railway to Duluth. During the crop year of 1907-1908, there was a total shipment of 62,107,513 bushels, and of this 47,743,336 bushels were shipped by boat, and 14,364,177 went by rail. The total amount invested in terminal and country elevators and warehouses in the Manitoba Grain Inspection Division is approximately \$11,707,000.

The rates in force at Public Terminal Elevators are—

For receiving, elevating, cleaning, spouting and insurance against fire, including fifteen days free storage, $\frac{3}{4}$ cent per bushel. When it is necessary to re-clean grain in order to ascertain the amount of domestic grain of commercial value contained in the screenings, a charge of one-half cent per bushel is made for extra treatment.

Foremost in the business interests of the West, stands the Winnipeg Grain Exchange, which, in the comparatively short space of twenty years, has reached an enviable position among the leading grain institutions of the world. The Winnipeg Grain and Produce Exchange was incorporated in 1891, after having been organized for several years. Commencing with a membership of ten, and an entrance fee of \$15, the Exchange has, in less than two decades, reached such a commanding position that the leading grain dealers of the continent consider it imperative to become members. The value of the seats has reached \$2,500, and the membership numbers 300.

The objects of the Exchange, as outlined in the articles of incorporation, were declared to be—"to compile, record and publish statistics, and acquire and distribute information respecting the produce and provision trades, and promote the establishment and the maintenance of uniformity in the business, customs and regulations among the persons engaged in the said trades throughout the province, and to adjust, settle and determine controversies and misunderstandings between persons engaged in such trades." The record of the past years clearly indicates that these objects have been fully attained.

Through the efforts of the Exchange, permanent standards have been secured for the various grades of grain, and those have proved of great benefit to both the producer and grain dealer throughout the West

The different grades are named thus:—"No. 1 Manitoba Hard," "No. 1 Manitoba Northern," "No. 2 Manitoba Northern," "No. 3 Manitoba Northern," "Commercial grade No. 4," "Commercial grade No. 5," "Commercial grade No. 6," "Commercial grade, feed." The grade "No. 1 Manitoba Hard," consists almost altogether of hard, red, plump kernels. In every hundred only about three immature, shrunken kernels are allowed and the sample must be practically free from "frosted" kernels, i.e., kernels with pale, roughened skin, due to the action of frost or water, and there must be no appreciable odor of smut.

"No. 1 Manitoba Northern" is distinguished from "No. 1 Hard," chiefly by the larger proportion of starchy kernels present, and of those which are somewhat shrivelled. It has about ten shrunken kernels in every hundred, and is practically free from kernels showing the action of water or frost. "No. 2 Northern" is very much like "No. 1 Northern," but with a slightly larger proportion of defective kernels, about twelve in every hundred. "No. 3 Northern" contains about twenty-three defective kernels in every hundred. "No. 4" has about thirty defective kernels in every hundred, while "No. 5" contains about fifty-six defective kernels, forty of which may be shrunken. "Commercial grade No. 6" contains about sixty-five damaged kernels, while Commercial grade rated as "feed" contains about eighty-eight defective kernels in every hundred, and the sample usually possesses a distinct odour of smut.

In the prices received for those different grades, there is considerable variation. "No. 1 Hard" always sells for one cent more than "No. 1 Northern," while there is a difference of from four to six cents between each of the following grades. During the four months from September 1st, 1908, to January 1st, 1909, about 83 per cent. of the crop was marketed. The average price

for all grades of wheat has been estimated in one computation at 85 cents, and with the price for "No. 1 Northern" hovering about a dollar, as was the case during those four months, this average may be considered fairly representative. The price of oats held fairly steady between 35 and 40 cents, and, if allowance be made for low grades and freight rates, the average return to the farmer may be placed at not less than 27 cents per bushel. Barley held up in price throughout the season and has been valued at the rate of 40 cents per bushel.

Manitoba is not merely a wheat growing and exporting country. Every branch of farming has made rapid strides of late years. The products include oats, barley, flax, rye and peas; the Manitoba root crop alone amounts to 8,568,386 bushels and the dairy products to 3,918,-568 lbs. of the value of \$10,604.31.

The development of the live stock trade has been very great. This is shown by the increase in the stock marketed. The past year was an excellent one for the rearing and shipping of live stock, the receipts at the Winnipeg stock yard were nearly double those of any similar period. Not only is there much improvement in the number of cattle marketed, but also in their quality. The total receipts at Winnipeg for 1908, were 170,088 head, and of these about 91,045 cattle were suitable for export. The remainder were sold as "stockers" and "feeders."

Many farmers now ship their own cattle and do their own selling on the market. This fact has made the competition much keener between buyers than it was previously. However, most of the arrivals of butchers' and feeders' stock are sold by farmers to buyers in the country, who again sell to dealers in Winnipeg. The prices for average export cattle have been about \$47 per head at the shipping point. For butchers' stock

the average price to the farmers has been about three cents per pound. This price is small but is accounted for very largely by the fact that the Winnipeg market for butchers was glutted during most of the past season. A number of "butchers" and "feeders" were taken East to Toronto and Montreal, and others, South to St. Paul and Chicago. The Winnipeg market, however, provided for nearly 64,000 head, a number slightly out of proportion to actual requirements. Each year a greater number of these cattle are being "fitted" before being marketted, and, as this process becomes more general, the price will improve.

The average weight of the "butchers" and "feeders" at Winnipeg, was 1,061 pounds, in 1908, and the average price \$3.53, giving a total value of \$2,966,483 for one year. The total amount paid out for cattle at the yards was \$7,245,589.

It is believed that the West will become a great hog-raising country. In the year 1908, there was an increase of 63,640 as compared with the previous year, the total receipts at Winnipeg numbering 145,269. The yearly packing capacity of Winnipeg, is 450,000. The Winnipeg market price for hogs is very largely controlled by the price for which bacon can be brought in from the United States. Hogs, like butchers' cattle, are mainly bought in Winnipeg through middlemen, but the prices vary less than for cattle. The average price paid last season was \$5.70 per cwt. at Winnipeg, and, to the farmers at their own station, about 5 cents per pound.

The sheep industry is not yet very extensive. The mutton receipts show each year but slight increase, as Winnipeg still continues to bring frozen mutton from Eastern Canada during the past year; as much as eight cents per pound was paid on the hoof for lambs off cars at Winnipeg. The live stock industry in Western Canada is still in its infancy, but there are already indications

of a considerable increase in a very short time. Farmers are beginning to realize that the fertility of the soil must be retained, and that this is best done by the rearing and feeding of live stock.

AGRICULTURAL EDUCATION

The Province of Manitoba is so young that most of its industries are still in the making. The first and paramount of these is farming, but even this is only in its infancy. "Extensive" rather than "intensive" methods have been followed. The farmers reaped crop after crop of wheat until they found that their land would not continue for many years to respond to this treatment. To-day in Manitoba, conditions are such as to demand the employment of more scientific methods of agriculture. To disseminate a knowledge of these is the function of our system of agricultural education.

Until within the last few years, agricultural education has been carried on by the Experimental Farms, the Agricultural Societies, the Breeders' Association, and the Agricultural Press. The first Experimental Farm was founded by Lord Selkirk, in 1816, at Hayfield, and was carried on until 1822. In 1837, the Hudson's Bay Company founded an Experimental Farm a short distance from Fort Garry, on the Assiniboine River. This farm also had only a short career of some ten or eleven years. In 1888, the Dominion Government called upon Dr. William Saunders and Professor S. A. Bedford, to choose sites for two farms in the West. These are situated at Brandon and Indian Head. The farm at Brandon was ably managed by Mr. Bedford, for over eighteen years. During this time good work was done for the West in introducing early-ripening varieties of wheat by experiments in raising and feeding stock, and in the

testing of fruit and forest trees, as well as grasses and fodder plants.

The Provincial Department of Agriculture has been active, also, in educational work, and has always been generous in making grants of money to the Agricultural Societies, Farmers' Institutes, Dairy Association, Breeders' Association, and Horticultural Society, and in other ways. Farmers' Institute meetings have been held in Manitoba ever since 1890, and Agricultural Fairs since 1892. Reports show that 56 Agricultural Fairs and 122 Institute meetings were held in Manitoba during the year 1908. In the winter of 1907-1908, the Provincial Government offered \$50 to each of ten Agricultural Societies if they would subscribe equal amounts in order to hold Seed-Grain Fairs. This experiment proved so satisfactory that the offer has been made general, with the result that some thirty fairs were held during the past winter. The summer of 1908, was the first in which farming competitions were held, although previous to this, prizes had been offered for the best fields of standing grain. Special mention should be made of the judging-schools, which have been held since 1902, under the auspices of the Live Stock Association, whose meetings were formerly held in Winnipeg but are now held in Brandon during March, in each year. In 1906, a seed-grain special train carrying a corps of Institute speakers, travelled through the provinces and called at all the important towns, and in 1907, a special dairy train, suitably equipped, visited the leading dairy sections of the province.

The magazines giving space to agriculture in Manitoba, are the Nor'-West Farmer, the Farmers' Advocate, The Canadian Thresherman, Farm Crops, and the weekly editions of the Free Press, Telegram, and Tribune. The value of such periodicals in disseminating agricultural information cannot be over estimated. In the

schools, agriculture has been a subject of the curriculum since 1896. The work prescribed is, however, rather "nature study" than systematic agriculture. For the High Schools and Collegiates, a short course in agriculture is outlined, to be taken by pupils pursuing the Third-Class Teachers' Course. This covers a brief study of plants in their relation to water, soil and air; the origin, drainage and improvement of the soil; the different crops; and the live-stock of the farm. Experiments are performed in elementary physics and chemistry, bearing upon agriculture. During the past summer, a further step has been taken in elementary agricultural education. All second and first-class teachers are required, while taking their professional training at the Normal School, to spend one month at the Provincial Agricultural College.

In 1906, the Manitoba Agricultural College was opened and 85 students registered in the general course. The next session 143 were enrolled, while during the past session 170 were in regular attendance. A special dairy course is held for those who wish to prepare themselves to manage and operate cheese factories and creameries in the province. In 1908, a short course in Engineering was begun to meet the demand for instruction in working steam and gasoline engines, which are so much used in modern farming.

"Farmers' Week" at the college has now become an important factor in agricultural education. The Agricultural Societies, Dairy Association and Horticultural Society hold their annual conventions at this time, and, in order to make the gathering of greater interest to the hundreds of farmers who attend, the regular classes, are suspended, and short courses are given in stock-judging, grain-judging and engineering, for their special benefit.

Over half a million dollars have been spent in the

buildings and equipment of the college. These include a main or administration building, a mechanical and engineering building, a students' residence, powerhouse, greenhouse, principal's residence, farm foreman's residence, stock judging pavilion, and barns. The mechanical building, recently erected, is 100 feet square and three storeys in height and contains a blacksmith's shop equipped with 50 forges and anvils, an equal number of work benches in the carpenter shop, and a machinery department containing all kinds of farm machinery, such as ploughs, harrows, seeders, binders, mowers, manure spreaders, hay loaders, packers, wagons, a threshing machine, and steam and gasoline engines, the majority of which have been presented to the college. In the stables pure-bred stock—horses, cattle, sheep, swine, and poultry—are kept for educational purposes.

The work in the regular course is covered by the following departments—Field Husbandry, Dairying, Veterinary Science, Horticulture and Forestry, Agricultural Chemistry, Soil Physics, Biology, Farm Management, and English. The regular course extends over a period of two winter sessions of five months each and is controlled by an Advisory Board, which issues a diploma in agriculture to each student who completes the two-year course and returns to the farm to engage in practical agriculture. This Board is composed of the Minister of Agriculture of Manitoba, two members appointed by the Lieutenant-Governor in Council, two appointed by the University of Manitoba, and five by the Agricultural Societies of the Province. In 1908, the college was affiliated with the University of Manitoba, and a course has been added for those wishing to proceed to a degree in agriculture.

A society called the M.A.C. Research Association was organized in 1907, and has already done good work.

It has for its object the making observations and collecting data on agriculture by the past and present students of the college. The young farmer has every reason to be grateful for the generous provision which the Province has made for his education; and it is hoped that before long adequate provision will be made for the teaching of domestic science. Before many years have elapsed it will probably be necessary to establish agricultural high schools throughout the Province, as has been done in Ontario. We may reasonably hope that the foresight exemplified in our institutions for agricultural education will produce a race of farmers who will consider not merely their personal aggrandisement but will have regard to the advantages to be reaped by posterity from a scientific tillage of the land.

THE GEOLOGY OF CANADA

By R. W. BROCK,

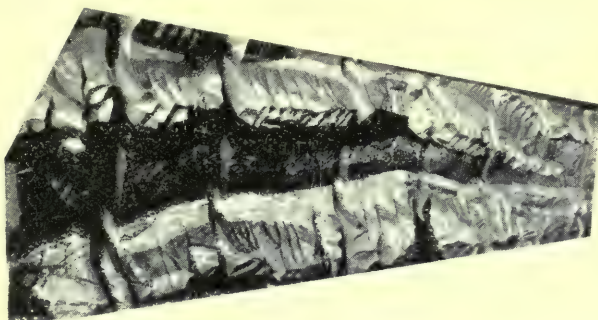
Director of Geological Survey, Dominion of Canada.

FOR an outline of the geology and physical features of Canada, I have thought that nothing better could be presented than the chapter prepared by the late George M. Dawson for the Handbook of Canada issued by the local executive of the British Association for the Toronto meeting. The present sketch is therefore based upon Dawson's Physical Geography and Geology of Canada, revised and in parts expanded. This has been done with the co-operation of Mr. W. McInnes, Mr. R. G. McConnell, Mr. G. A. Young, and Mr. O. E. Leroy.

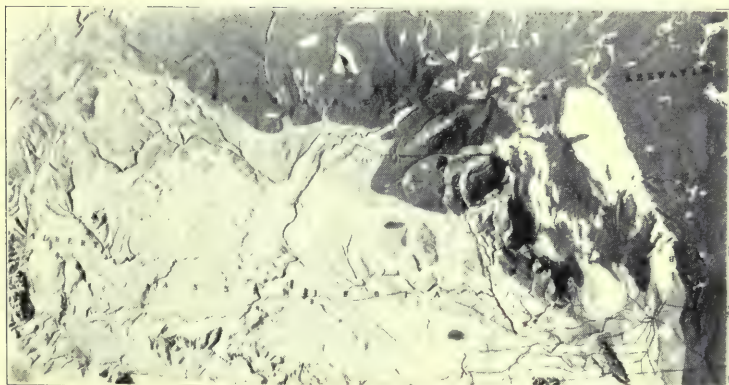
A great part of Canada is as yet unexplored, and over a large portion only reconnaissance surveys have been made, but enough has been done to establish a correct conception of the general geological structure of the country.

Since the greatest part of Canada is unprospected, we do not know what latent mineral wealth awaits development, but we do know that there is in Canada one of the greatest tracts of unexplored mineral land in the world, and sufficient has already been accomplished to demonstrate that Canada is destined to become one of the great mining countries.

The development of the mineral resources has been slow, on account of the abundance of excellent agricultural land, which made Canadians an agricultural people. In recent years, however, attention has been directed to its mineral resources, and a mining industry is rapidly developing. In 1886 the mineral production



Model of Cascade Basin, Rocky Mountains



The Plains, from Relief Model

of Canada was under ten and a quarter million dollars in value, while last year it was eighty-seven million.

This development is making necessary a corresponding increase in the attention given to the study of the geology of the country, so that the knowledge of the geological structure of Canada may be expected to rapidly extend.

Canada embraces the northern half of the continent of North America with its adjacent islands, including those of the Arctic Ocean, between the 141st meridian and Greenland, but exclusive of Alaska in the extreme north-west, the island of Newfoundland, which still remains a separate British colony, and the small islands of St. Pierre and Miquelon, retained by France. The total area of Canada is estimated at about 3,729,665 square miles, of which the Arctic islands to the north make up over 500,000 square miles. This area is somewhat larger than the United States (including Alaska), and not much less than all Europe.

The form of the North American continent may be described as that of an isoscles triangle, of which the narrower part, pointing south, constitutes Mexico, a wide central belt, the United States, while the broader base is the Dominion of Canada. The northern margin of the continental land lies approximately on the seventieth parrallel of north latitude, but in the east the land area is continued northward by the great islands of the Arctic archipelago, while south of these the continent is broken into by the large but shallow sea named Hudson Bay, 800 miles from north to south and some 600 miles in width.

Surrounding Hudson Bay lies the Laurentian plateau or "Canadian Shield," a tract of land underlain by pre-Cambrian rocks and, though relatively elevated, never rising over 2,000 feet above the sea except in the extreme north-east. Spreading widely in the Labrador peninsula, this upland runs with narrow dimensions round

the southern extremity of Hudson Bay and thence is continued north-westward to the Arctic Ocean. Along the southern margin of the Laurentian plateau lies the great waterway, the River St. Lawrence, running to the very centre of the continent and expanding there into the group of inland fresh water seas generally spoken of as the Great Lakes, while the Winnipeg system of lakes, with Athabasca, Great Slave and Great Bear Lakes, occupy a very similar position on the outer rim of the north-western extension of the plateau.

Never far distant from the oceans, and following the trends of the south-east and south-west sides of the Laurentian highlands respectively, the Appalachian mountains and those comprised in the western Cordilleras converge to the south, embracing between them, to the south of the Great Lakes, the central plain of the continent that, west of the Laurentian plateau, extends northward through Canada to the Arctic Ocean. But in the east, in Canada, the Appalachian range more closely follows the border of the Canadian Shield, separated from it, till the Great Lakes are reached, only by the valley of the St. Lawrence River. While the two mountain systems of the continent are, with respect to one another, symmetrically disposed, they are opposed in extent and character. The Cordillerian system of the west embraces a truly mountainous tract, over which large areas are elevated more than 5,000 feet above the sea, with peaks rising to heights of 10,000 feet and more. On the other hand, the mountains or hills of the Appalachian system, in Canada, seldom rise more than 2,000 feet above the sea, and over the greater part of the eastern provinces of New Brunswick, Nova Scotia and Prince Edward Island the land lies below the one thousand foot datum line.

Only the most general notice can be given to the rivers and lakes of Canada, but no feature of the country is

more important, whether historically or geographically, than the great length and volume of its principal water-courses and the manner in which these interlock and penetrate almost every part of the area. Besides the St. Lawrence, with its drainage basin of 530,000 square miles, there are three more rivers of the first class of which the watersheds are wholly or in great part included in Canada. These are the Nelson, the Mackenzie and the Yukon. The first-named reaches Hudson Bay, bringing with it the waters of the Saskatchewan and other large and long rivers which drain a vast region in the centre of the continent. Its basin is estimated at 367,000 square miles. The Mackenzie, flowing into the Arctic Ocean, drains not only most of the northern part of the interior plain of the continent, but also considerable portions of the Rocky Mountain region and the Laurentian plateau, with a basin of about 677,000 square miles. Next to the St. Lawrence it is the longest river of Canada, being not less than 1,800 miles from its source to its mouth. The Yukon, discharging into the northern part of Behring Sea, drains a great tract of the northern part of the Cordillerian region comprised in Canada, besides flowing across the whole width of Alaska.

It is only by contrast with these greatest rivers that many more are relegated to a second or third rank, as an examination of a map will show. It will also be apparent that much the larger part of the country lies on the northern slope of the continent regarded as a whole, and that the remainder is divided between the Atlantic and Pacific sides, only an inconsiderable region being tributary to the southward-flowing system of the Missouri and its branches.

It may be useful in this connection to state the heights of a few of the larger lakes, as ruling features in physical geography. The Great Lakes, although they stand at four levels, in reality occupy only two distinct stages,

separated by the Niagara Falls. Below this cataract is Lake Ontario, 246 feet above the sea, above it Lake Erie, 572 feet, Lake Huron and Lake Michigan, 581 feet, and Lake Superior, 602 feet. Further to the west and north-west are Lake of the Woods, 1,057 feet, Lake Winnipeg, 710 feet, Lakes Manitoba and Winnipegosis, 810 and 828 feet respectively, Athabasca Lake, 690 feet, Great Slave Lake about 520 feet, and Great Bear Lake about 390 feet. Each of these lakes marks the lowest level of large tracts of adjacent land.

From a physiographical and geological standpoint, the Canadian part of the continent may very naturally be regarded as composed of two great divisions—an eastern and a western—the line between these beginning at the south near Winnipeg and running thence along the outer edge of the Laurentian plateau north-westward to the Arctic Ocean. To the east of this line, while the surface is generally broken and irregular, the relief is nearly everywhere comparatively low. The rocks are almost altogether referable to the Palaeozoic systems or to systems older than these, and there is little evidence of important changes during the later geological periods beyond such as is incident to the gradual wearing away and denudation of ancient highlands and mountain systems.

To the west the Mesozoic and Tertiary systems become important. The entire spread of the great plains is floored by such rocks, and they occupy also a large part of the western Cordilleran belt, although there mingled with important areas of much older rocks. Many of the mountain ranges of the Cordillera are rugged, new and lofty, and the processes of denudation are still going on very rapidly, with rivers and streams flowing at high grades and very far from that passive condition, where the drainage system has approximately reached the base-level of erosion.

A two-fold division of the northern part of the continent, of the kind above indicated, although based upon fundamental facts, is, however, much too general for the purposes of description of its several regions. The boundaries of the several provinces, resulting from circumstances of a more or less political kind, do not always correspond with the natural features and cannot therefore be adopted as the best for purposes of geographical and geological description. Relying chiefly upon the physical and geological facts, we may therefore further subdivide Canada as follows:—

(1) **The Appalachian Region**, including the Maritime Provinces of the Atlantic and the south-eastern part of the Province of Quebec bounded by a line running from the Straits of Belle Isle to the City of Quebec and thence to Lake Champlain.

(2) **The Lowlands of the St. Lawrence Valley**, extending, with an irregular width, from the City of Quebec to Lake Huron and including the Ontario peninsula.

(3) **The Laurentian Plateau.**

(4) **The Arctic Archipelago.**

(5) **The Interior Continental Plain**, running from the 49th parallel to the Arctic Ocean and including part of Manitoba, Saskatchewan, Alberta and the North-West Territories.

(6) **The Cordillera**, or great mountain belt of the west, including the greater part of British Columbia and the whole of the Yukon district.

The Appalachian Region of Canada includes the Maritime Provinces of Nova Scotia, New Brunswick and Prince Edward Island and the portion of the province of Quebec lying east of the St. Lawrence River up to the City of Quebec and from there east of a line running south-westerly to Lake Champlain. The region is part of a zone that has been the seat of successive mountain

building forces that gave form to the eastern part of the North American continent and yielded the Appalachian mountain system that, commencing not far north of the Gulf of Mexico, runs north-eastward through the Atlantic states and eastern Quebec to the Gulf of St. Lawrence. This mountain system is represented in Vermont and New Hampshire by the Green and White Mountains, and its main line runs on, though with much decreased elevation, through the south-eastern part of the Province of Quebec, under the name of the Notre Dame Mountains. Not far below the City of Quebec it approaches the St. Lawrence, and thence continues parallel with that river and its great estuary, all the way to Gaspe on the open gulf. In the Gaspe peninsula it is known as the Shickshock Mountains. Considerable parts of these mountains rise above 3,000 feet, but the Notre Dame range seldom exceeds 1,000 or 1,500 feet, and its elevations resemble rolling and broken hills and ridges rather than mountains properly so called. The whole length of this main continuation of the Appalachian system in Canada is about 500 miles.

Subordinate and less continuous elevations, nearly parallel to the main ridge thus outlined, occur in New Brunswick, chiefly along two lines, one of which strikes Chaleur Bay below its head, the other, somewhat divergent in direction to the eastward, borders the southern shore of the province along the Bay of Fundy. Though lying at some distance to the south, eastward of the main line, the peninsula of Nova Scotia may best be regarded as a member of the Appalachian system of uplifts, with which it is parallel. Its elevation nowhere exceeds 1,200 feet, and is in general very much less. A broad range of broken hills and uplands extends along the Atlantic coast of the province and into the island of Cape Breton.

In the general sense in which the term "Appalachian Region" has been employed, it has thus a width of

about 350 miles between the outer coasts of Nova Scotia and the St. Lawrence estuary. Followed to the south-westward, this belt of country embraces the New England States and part of New York, all with very similar physical features. In the opposite direction it is interrupted by the Gulf of St. Lawrence, but reappears in the great island of Newfoundland, still preserving most of its characteristic features. Throughout this region, including Newfoundland, the geological structure is very similar, the formations represented are nearly the same, and both in composition and from a palaeontological standpoint they often resemble those of the opposite side of the Atlantic more closely than they do those of other parts of America.

Much of the area comprised in what has been designated the Appalachian Region, in Quebec and New Brunswick, affords excellent arable land or supports valuable forests. The character of the soil varies greatly, chiefly in conformity with that of the subjacent rocks, but it has also been considerably affected, as almost all parts of Canada, by the nature and amount of the deposits due to the glacial period. The best arable lands of Nova Scotia are situated towards the Bay of Fundy and along the northern side of the peninsula generally. The surface of Prince Edward Island is for the most part fertile and highly cultivated, and nowhere exceeds 500 feet above the level of the sea.

The geological scale is well represented in the Appalachian Region from the pre-Cambrian to the Triassic, but thereafter ensues a long gap, during which no deposits appear to have formed, probably because the area in question then existed as land, exposed to denuding agencies alone. Closing this unrepresented lapse of time, we find only the clays, sands and drift referable to the glacial period.

Though lying eastward of the chief axis of elevated country in Quebec, and no longer mountainous the

Maritime Provinces owe their main physical features and geological structure to the same general forces that operated in the case of the more typical mountainous districts in Quebec. The depression of the Bay of Chaleur, the northern highlands of New Brunswick and the hilly country of the same province bordering the Bay of Fundy, this body of water itself and the peninsula of Nova Scotia, all at least roughly parallel the general north-easterly Appalachian trend. These physical features reflect the broader geological structures of the country, whose strata up to and including the Devonian are in general folded along axes following a north-easterly course. But the Carboniferous and overlying Permian strata occupying the low, triangular basin in New Brunswick fronting on the Gulf of St. Lawrence, lie flat and comparatively undisturbed, and with similar attitudes underlie the Province of Prince Edward Island, though in their extension eastward through Nova Scotia into Cape Breton, they frequently occur in a highly disturbed condition.

Rocks of pre-Cambrian age occur along the lines of main uplift in south-eastern and north-eastern Quebec, in the northern and southern highlands of New Brunswick and in Cape Breton. In Quebec, the pre-Cambrian is largely, if not solely, composed of igneous rocks, chiefly basic eruptives and their derivatives; in New Brunswick and Nova Scotia, crystalline limestones, various schistose rocks, possibly of sedimentary origin, and acid and basic igneous rocks occupy the pre-Cambrian areas.

Forming the backbone of the peninsula of Nova Scotia, and bordering the whole Atlantic coast, is a belt characterized by a group of sediments invaded by large batholithic bodies of granite, probably of Devonian age. This sedimentary group has yielded a section at least 5,000 feet thick, and has generally been regarded as of Lower Cambrian age, though possibly it should be classed as pre-Cambrian. The group is divisible into a lower

quartzite series and an upper argillaceous series. The strata have been thrown into a great series of parallel, sharp flexures with which the distribution of the widespread auriferous quartz veins is so closely connected.

Undoubted Cambrian strata, often richly fossiliferous, occur in Cape Breton, in the neighborhood of St. John, New Brunswick and in Quebec, where they almost continuously border the St. Lawrence River from the extremity of Gaspé peninsula to Quebec City, continuing thence in a more broken zone to the Vermont border. In all the areas the strata in general are argillaceous or arenaceous, and range in age from the lowest to the highest Cambrian, at times passing upwards, without a break, into the Ordovician. But while the lower beds of the 5,000 to 6,000 foot, Quebec section, are characterized by the presence of the *Ollenellus* fauna, the corresponding strata of the 2,000 to 3,000 foot section of the Maritime Provinces are distinguished by the occurrence of the *Holmia* fauna.

Ordovician strata occur throughout the eastern part of the Province of Quebec, often infolded with the Cambrian and pre-Cambrian formations. Fossiliferous beds of this age occur in northern New Brunswick, but the system is chiefly represented in this province and in Nova Scotia by areas of highly disturbed, mainly volcanic rocks.

Silurian rocks are widely spread in northern New Brunswick and in the adjacent portions of Quebec, occupying the greater part of this area which drains to the Bay of Chaleur. They recur in the southern part of New Brunswick and in the northern part of Nova Scotia, and though comprising limestones, calcareous shales and sandstones, are often greatly intermixed with contemporaneous volcanic material.

Devonian strata, only sparingly represented in southeastern Quebec, are extensively developed in Gaspé, where this system has yielded a section of about 9,000

feet, of which the lower 2,000 feet are largely of marine, calcareous strata, while the upper portion is chiefly of sandstone and conglomerates containing a remarkably rich flora. About the head of the Bay of Chaleur rocks of this age have yielded many interesting fish remains, comparing closely with those of the Old Red Sandstone. Somewhat analogous conditions appear to hold elsewhere in the Maritime Provinces, while, at times, the lower part of the Devonian in Nova Scotia is represented by fossiliferous limestones with iron ore.

While during Devonian times a large part of the Appalachian Region appears to have been a basin of deposition, the period was also marked by extensive invasions of plutonic rocks, chiefly granites, in south-eastern Quebec, New Brunswick and Nova Scotia. Towards the close of the Devonian, or in early Carboniferous times, the activities of the mountain building forces in this region seem to have culminated, and over extensive areas the Carboniferous and Permian strata still occur in nearly horizontal beds.

The Carboniferous system, both from its extent and because of its economic value, must be considered as one of the most important features of Nova Scotia and New Brunswick, and there is reason to believe that much larger tracts of this formation still lie beneath the waters of the Gulf of St. Lawrence and the Atlantic. Its total thickness is, in some parts of Nova Scotia, estimated at 16,000 feet, but it is very irregular in this respect and over the greater part of New Brunswick is comparatively thin. At the Joggins, on the north arm of the Bay of Fundy, is a remarkable continuous section showing 14,570 feet of strata, including seventy seams of coal. From beds in this section numerous specimens of a land-inhabiting reptilian fauna have been described. The flora of the period is well represented in many places, particularly in Nova Scotia, and includes that of several distinct stages, beginning with the Horton group at the

base (comparable with the "calciferos sandstone" of Scotland) and at the top containing so many forms referable to the Permian that the name Permo-Carboniferous has been applied to this part of the section.

Several local unconformities have been determined in different parts of this great succession of beds. With the marine limestones important deposits of gypsum are found. The workable coal seams occur in what is called the Middle Carboniferous, and some of these, in the Pictou district, are of unusual thickness. Coal mining is actively in progress in Cumberland and Pictou counties and in Cape Breton, the total annual output being between six and seven million tons. In New Brunswick the productive area for coal appears to be small, and the seams so far found are of inconsiderable thickness.

Triassic measures occur along the greater part of the Nova Scotia shore of the Bay of Fundy, by dikes and cut sills of diabase or overlain by thick sheets of the same material. Similar, but much less extensive beds, occur on the opposite, New Brunswick, shore. From Triassic times onwards to the Glacial period the Appalachian Region of Canada appears to have been continuously elevated, undergoing denudation, and perhaps during the Cretaceous period the eastern part was pene-planated. Some facts respecting the glacial deposits of the Appalachian Region are given on a later page, with general statements relating to this period in Eastern Canada.

To complete this very brief review of the geology of what has been called the Appalachian Region it now only remains to add a few words concerning that main line of uplift and disturbance the course of which was first traced through the Province of Quebec, from the vicinity of Lake Champlain to Gaspé. This structurally complicated belt of country has been the subject of much controversy, and possesses a literature of its own. It is bounded to the north-westward by an important dislocation or break, known as the St. Lawrence and Champlain

fault, which may be traced from Lake Champlain to Quebec City and thence follows the estuary of the St. Lawrence, probably running to the south of Anticosti. To the west of this line are the flat-lying Ordovician strata of the St. Lawrence plain, chiefly limestones, and doubtless resting upon a strong shelf of the Laurentian nucleus at no great depth. Against this stable edge the eastern strata have been folded, faulted and ridged up by the forces which produced the Appalachian range. Were this all, a careful study of the beds on the two sides of the line would readily show their identity; but it appears that previous to the great epoch of disturbance the original physical conditions themselves differed. To the west a sheltered sea came into existence about the close of the Cambrian period, in which Ordovician strata, in large part limestones, were laid down. To the east sedimentation began much earlier, and the circumstances of deposition were different and more varied. Even the animal life present in the two districts was largely dissimilar at the same period. Thus it was not until much study and thought had been given to the problem that Logan was enabled to affirm the equivalency of a great part of the strata on the two sides of the St. Lawrence and Champlain fault. To those on the east, differing in composition and fauna from the rocks of the typical New York section, he applied the name "Quebec Group." Subsequent investigations have shown, however, that in the ridging up of this part of the Appalachian region not only are some very old Cambrian rocks brought to the surface, but considerable areas of crystalline schists, which are evidently pre-Cambrian.

The Appalachian Region in Canada, as in the United States, is productive of minerals. In the eastern townships of Quebec are the celebrated asbestos deposits that furnish 90 per cent. of the world's supply. Chromite, copper and iron pyrites are also mined in this region. Considerable placer gold has been recovered. In Nova

Scotia are some of the principal coal mines of Canada, notably at Sydney, Port Hood, Mabou, Inverness, Chimney Cove, Pictou, Cumberland and Joggins. Gold has been produced for over forty years. Antimony, tin and tungsten are also receiving attention. Iron ore has been mined for many years. Manganese ore occurs in both Nova Scotia and New Brunswick, sometimes of exceptional purity. Gypsum occurs in large bodies up to 150 feet in thickness, and is extensively worked. Bituminous shales, rich in oil, and ammonium sulphate are found in New Brunswick and Nova Scotia. Whetstones and building material of excellent quality are found in abundance.

Lowlands of the St. Lawrence Valley. The tract of country, which it is found convenient to include under this name, comprises but a small part of the hydrographic basin of the great river, which in all is about 530,000 square miles in extent. Although not altogether uninterrupted, it is clearly enough defined in a general way by the edge of the Laurentian plateau on the north, the Appalachian highlands to the south-east, and on the south, further west, by the line of the St. Lawrence River and the lower members of the system of the Great Lakes. It may be described as extending from a short distance below the city of Quebec to Lake Huron, with a length of over 600 miles and an area of more than 35,000 square miles, all of which may be regarded as fertile arable land—the greatest connected area of such land in Eastern Canada.

These lowlands are based upon nearly horizontal strata, ranging in age from the latest Cambrian to the Devonian. On a geological map its limits are readily observable, but in order to understand its character it is necessary to consider it somewhat more closely, and under such scrutiny it is found to break up naturally into three parts. The first of these lies partly in Quebec and partly in Ontario, extending west along the St.

Lawrence and its great tributary, the Ottawa, to a north-and-south line drawn about twenty-five miles west of the city of Ottawa, or somewhat past the 76th meridian. It is here interrupted by a projecting, but not bold, spur of the Laurentian plateau, which crosses the St. Lawrence at the lower end of Lake Ontario, forming there the Thousand Islands, and runs southward to join the large pre-Cambrian tract of the Adirondacks in the State of New York. This eastern division, with an area of 11,400 square miles, constitutes what may be called the St. Lawrence plain proper. Much of its surface is almost absolutely level, and it nowhere exceeds a few hundred feet in elevation above the sea, although a few bold igneous hills stand out in an irregular line, with heights of 500 to 1,800 feet. Mount Royal, at Montreal, is one of these, and from it all the others are in sight, while the Laurentian highlands may also be seen thirty miles to the north, and to the southward the Green Mountains and Adirondacks, forming the boundary of the plain in that direction, are apparent on a clear day.

Beyond the projecting spur of ancient crystalline rocks above referred to, from the lower end of Lake Ontario, near Kingston, to Georgian Bay of Lake Huron, the southern edge of the Laurentian plateau runs, in a slightly sinuous line, nearly due west for 200 miles. Between this edge and Lake Ontario on the south lies a second great tract of plain, the lowest parts of which may be considered as level with Lake Ontario (246 feet), but of which no part exceeds 1,000 feet above the sea. This plain is naturally bounded to the south and west by the rather bold escarpment of the Niagara limestone, which, after giving rise to the Falls of Niagara between Lakes Ontario and Erie, runs across this part of the Province of Ontario to Lake Huron, forming there a long projecting point and continuing still further west, in the chain of the Manitoulin Islands. The area of this second tract of plain is about 9,700 square miles. It is scarcely

more varied in its surface than that to the eastward, and throughout most of its extent is a fertile farming country.

The third and last subdivision of the lowlands of the St. Lawrence Valley is an area of triangular form, included between the Niagara escarpment and Lakes Erie and Huron. This constitutes what is generally known as the Ontario peninsula, and its south-west extremity touches the 42nd parallel, the latitude of Rome. The area of the Ontario peninsula is 14,200 square miles, and both in soil and climate it is singularly favored. Grapes, peaches and maize are staple crops in many districts. To the north some tracts of this land are high and bold, but most of its surface varies from 500 to 1,000 feet above the sea.

The geological features of the lowlands of the St. Lawrence valley are comparatively simple. The rocks flooring the region lie either horizontally or at very low angles upon the spreading base of the pre-Cambrian mass to the northward, the crystalline rocks of which have frequently been met with in deep borings. The formations represented correspond closely with those of the New York section, and the series, beginning with the Potsdam sandstone, continues upward without any marked break to the Chemung or later Devonian.

In the first or eastern subdivision of this region, the Potsdam sandstone, although strictly speaking referable to the Upper Cambrian, physically considered is really the basal arenaceous and conglomeratic member of the Ordovician series which follows. The several members of the Ordovician occupy almost the entire surface, diversified merely by a few light structural undulations, which in several districts result in the introduction of some higher beds that are referred, although with some doubt, to the Silurian.

Passing to the second or central subdivision, to the west of Kingston all but the lower Ordovician formations, just referred to, are found to be repeated, in ascending

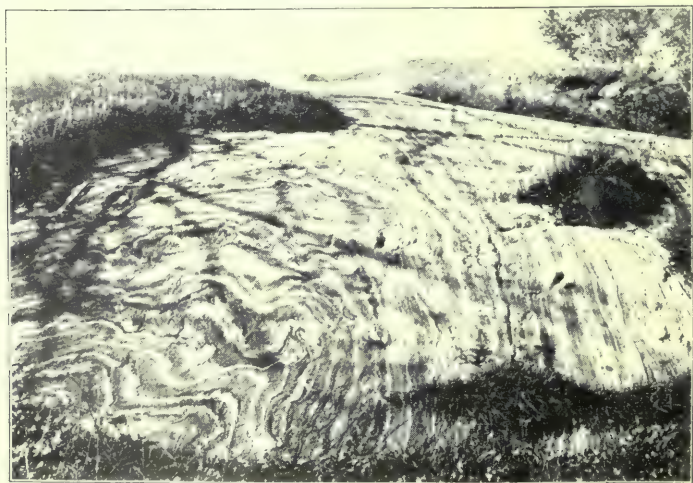
order, along the north shore of Lake Ontario, with very similar characters and equally undisturbed. The Trenton limestone occupies the greatest area, extending in a wide belt to Georgian Bay of Lake Huron. Above this lie the Utica shales, and over these the Hudson River formation. This is the highest member of the Ordovician, but the plain also overlaps the lower members of the succeeding Silurian system irregularly, finding its natural boundary from a physical point of view only at the massive outcrop of the Niagara limestone.

The course of the escarpement produced by this outcrop has already been traced; above it, and to the southwest, lies the higher plain generally known as the Ontario peninsula, constituting the third subdivision of the St. Lawrence lowlands. More than half of the area of this peninsula is occupied by Devonian rocks, which succeed the Silurian regularly in ascending order, the highest beds being met with in the extreme south-west of Ontario, beyond which they are soon followed by the Carboniferous basin of the Michigan peninsula. The Silurian and Devonian strata are affected only by slight and low undulations, but these are important in connection with the exploitation of the oil and gas of the region.

Though not a portion of the Laurentian lowlands, mention may be made at this point of the island of Anticosti, lying in the wide estuary of the St. Lawrence. The island is about 140 miles in length, and consists of nearly flat-lying rocks, chiefly of the Silurian, with some of Ordovician age, (Hudson River) along its northern side. The island evidently represents part of a submerged and undisturbed Ordovician and Silurian tract of the northern part of the Gulf of St. Lawrence, the rocks of which differ in some respects from their representatives further to the west, while in some instances the enclosed fauna find their closest analogy in the fauna of the distant Manitoulin Islands of Lake Huron. On the mainland, opposite to the island, lower members of the Ordovician occur,



Paulson's Narrows, Lake Opasatria
Typical Laurentian Scenery



Crumpled "Ottawa" Gneiss, Montebello, Quebec

resting on the pre-Cambrian, while further east, towards the Straits of Belle Isle, Cambrian strata repose on the ancient crystalline rocks.

In the two eastern subdivisions of the lowlands of the St. Lawrence valley, with the exception of structural materials, such as stone, lime and clay, minerals of economic value are scarcely found, but the clay and cement industries are becoming highly important; but in the third or westernmost subdivision, however in addition to these, gypsum, salt, petroleum and natural gas have become important products. The gypsum and salt are derived from the Onondaga formation of the Silurian. The salt is obtained in the form of brine from deep wells, but beds of rock-salt are known to occur at considerable depths. Petroleum is chiefly derived from the Corniferous limestone of the Devonian, and natural gas is obtained from several horizons in the Devonian, Silurian and Ordovician.

The Laurentian Plateau. The great region thus named, composed of very ancient crystalline rocks, has an area of over 2,000,000 square miles, or more than one-half that of the entire Dominion of Canada. In a horse-shoe-like form, open to the north, it surrounds three sides of the comparatively shallow sea known as Hudson Bay. Its southern part is divided between the Provinces of Quebec and Ontario, its eastern side expanding into the Labrador peninsula, while the western runs, with narrow dimensions, to the Arctic Sea, west of the great bay.

In geographical extent it is thus very important, although somewhat monotonous in its physical and geological features. It contributes little to the fertile areas of the country in proportion to its size, but in the aggregate comprises a considerable amount of land which is either cultivated or susceptible of cultivation. Elsewhere, in its southern parts, it carries forests of great value, and its mineral resources are already known in

some places to be very important. It constitutes, moreover, a gathering ground for many large and almost innumerable small rivers and streams, which, in the sources of power they offer in their descent to the lower adjacent levels, are likely to prove, in the near future, of greater and more permanent value to the industries of the country than an extensive coal field. Particularly notable from this point of view is the long series of available water power which runs from the Strait of Belle Isle nearly to the head of Lake Superior, coincident with the southern border of the plateau.

Although it is appropriate to describe this region as a plateau or tableland, such terms, it must be understood, are applicable only in a very general way. Its average elevation of about 1,500 feet is notably greater than that of the adjacent lands, and is maintained with considerable regularity, but its surface is nearly everywhere hummocky or undulating. Away from its borders, the streams draining it are, as a rule, extremely irregular and tortuous, flowing from lake to lake in almost every direction, but assuming more direct and rapid courses in deeply cut valleys as they eventually leave it. Many of the surface features are of very great antiquity, and in Labrador and elsewhere a number of the larger valleys existed much in their present form long before the Cambrian period.

The average height of the central parts of the Labrador peninsula is about 1,700 feet, and the most of its drainage is divided between Hudson Bay, Ungava Bay and the Atlantic coast, the main watershed lying not very far to the north of the St. Lawrence estuary and gulf. Along the Atlantic coast, to the north of Hamilton Inlet, the region assumes a really mountainous character, numerous elevations attaining 3,000 feet and some as much as 5,000 or 6,000 feet. These are the highest known points connected with any part of the Laurentian region, and are quite exceptional in character.

To the south of Hudson Bay the watershed is, at least in one part, as low as 1,000 feet. North of Lake Winnipeg the Nelson and Churchill Rivers cross the Laurentian plateau in a wide depression, to reach Hudson Bay. Still further north this part of the plateau has a height of over 1,200 feet above the sea.

Generally speaking, the surface of the plateau is barren and rocky, with wide, swampy tracts, especially towards the height of land. To the south and south-west of Hudson Bay it is overlapped by an important area of Silurian and Devonian rocks, over which, and the adjacent parts of the crystalline rocks, is rather uniformly spread a mantle of boulder clay of two distinct ages, overlain by remnants of marine clay which reach to a height of over 450 feet above the level of the bay. Lacustrine clays, deposited in the basins of glacial lakes, cover large areas, notably north-west of Lake Winnipeg and south of James Bay, where they constitute large tracts of arable land which will eventually be of value.

The striking features of the Laurentian plateau are innumerable lakes, large and small, with intervening rounded rocky elevations, wooded in their natural conditions to the south but rising above the tree line to the northward, while in the far north, on both sides of Hudson Bay, hills and valleys become eventually characterized by grasses, mosses and lichens alone, constituting the great "barren lands" of North America. The rivers and lakes are everywhere well stocked with fish, while deer and moose in the southern parts, and to the north the caribou, abound. Thus, where the region can be entered without undue difficulty, it has already become a much favored resort of the sportsman.

The Laurentian plateau, also known as the Canadian Shield and as Laurentia, is composed of several groups of rocks. As at present known, the oldest consists largely of volcanics, "greenstones," often schistose, accompanied by some sedimentary schists, limestones and

an "iron formation." This group, found in northern and western Ontario, and known as the Keewatin, rests on intrusive granitic rocks that also occupy large areas over which they are frequently gneissic. Some basic igneous rocks are also found intrusive in these older rocks.

This whole assemblage of prevailingly igneous rocks is characterized by its great metamorphism. It has been subjected to intense disturbances, regional in extent. It formed a land area whose surface was eroded into hill and vale, very much like the present surface of the Laurentian plateau, before the next succeeding, well recognized system of rocks known as the Huronian was laid down. This system is largely sedimentary, as the preceding was largely igneous; conglomerates, slates and quartzites are the characteristic rocks of this system. These relationships are best seen in the Lake Superior and Temiskaming regions, but over considerable districts they have been obscured by later intrusions of granitic rocks.

The Huronian as it occurs in the original locality on the north shore of Lake Huron is divisible into two portions, known as the Lower and Middle Huronian. Traced westward into the United States, the Huronian system has been found to be divisible into three portions, of which the upper, the Upper Huronian or Animikie, is typically developed in Canada near Port Arthur on Lake Superior. Younger than the Animikie, a group of sandstones, conglomerates and trap known as the Keewenawan or Nipigon system, is well developed near Lake Nipigon, north of Lake Superior. The age of these rocks is generally supposed to be pre-Cambrian, though by some held to be Lower Cambrian.

In eastern Ontario and the adjoining portions of Quebec the pre-Cambrian rocks consist of a distinctly stratified series of limestones and other sedimentary

rocks, usually highly altered and crystalline, with a second series of more gneissic intrusive rocks, whose apparent bedding is really a foliation due to pressure and which frequently pass into granites by imperceptible gradations. The first of these is known as the Grenville series, the second has been termed the Fundamental or Ottawa Gneiss.

Sir William Logan, who studied the "Fundamental" (Ottawa) Gneiss, the Grenville series and the Huronian, recognized the great unconformity between the Huronian and the older rocks and the metamorphosed character of the latter as contrasted with the comparatively unaltered, distinctly sedimentary nature of the former. He therefore divided the pre-Palaeozoic rocks into Huronian, which he defined as embracing the pre-Cambrian above this unconformity, and Laurentian, which embraced everything below.

An international committee on nomenclature, representing Canadian and American geologists, has recommended the following classification of the pre-Cambrian. Opposite is placed a classification based on Logan's and in general agreement with the use of the terms in the reports of the Canadian Geological Survey, though in reconnaissance work the distinction between Keewatin and Huronian has not always been observed.

(For the Lake Superior Region)	
Keweenawan unconformity	Keweenawan unconformity
Huronian { Upper unconformity Middle unconformity Lower unconformity	Huronian { Upper (Animikie) unconformity Middle unconformity Lower unconformity
Keewatin intrusive contact	Keewatin intrusive contact
Laurentian	"Fundamental" (Ottawa) Gneiss
(For Eastern Ontario)	
Grenville (Hastings) intrusive contact	Hastings— Grenville—
Laurentian	

In reference to the above table, it may be stated that

the Laurentian as defined by the International Committee is restricted to the pre-Huronian granites and gneisses, and that the relationships between Grenville and Keewatin, owing to their geographical distribution, is not yet established.

The greater part of the great Laurentian plateau, following the usage of the Canadian Geological Survey, may be represented as Laurentian, since it is dominantly underlain by granite rocks or their gneissic modifications, Keewatin or the Grenville series as found in their typical localities. But throughout this vast region are many areas, often of considerable extent, occupied by Huronian and, possibly, Keweenawan rocks. Both east and west of Hudson Bay rocks similar to the Animikie characterize considerable districts, and in the far north, west of Hudson Bay, are areas of rocks probably referable to the Keweenawan.

Though the region of the Canadian Shield was, during pre-Cambrian time, the seat of repeated widespread disturbances and invasions of plutonic rocks, amongst which the extensive bodies of anorthosite distributed along the south-western border of the region and the varied alkali and nepheline syenites of Eastern Ontario are especially notable, yet, since earliest Palaeozoic times the region does not appear to have been affected by regional disturbances, nor does there appear to have been even local intrusions of igneous rocks.

The rocks of the pre-Cambrian are remarkable for the variety of useful and valuable minerals they contain. Iron, copper, nickel, cobalt, silver, gold, platinum, lead, zinc, arsenic, pyrite, mica, apatite, graphite, molybdenite, feldspar, corundum, talc, actinolite, the rare earths, ornamental stones and gems, building materials, all are found, and most of them are being or have been profitably mined.

In the tongue of these rocks, which in the Lake Superior region extends into the United States, are the

great iron ranges, which have produced 400 million tons of ore, and which are expected to furnish 1,500 million tons more; and here also are the great Lake Superior copper mines that have produced four and a half billion pounds of copper and are still increasing their annual production. The fringe of the Laurentian plateau that is explored in Canada has also been prolific. Near Sudbury are the greatest nickel mines in the world, and in the Cobalt-Montreal River district what promises to be one of the greatest silver districts. Iron ore formation, which occurs in the Keewatin, Lower and Upper Huronian, occurs in patches throughout the whole extent of Northern Ontario into Quebec. Iron ores are also found in Eastern Ontario and Quebec. Copper is important in the nickel deposits, and is also found in separate deposits. Mica is an important product in Eastern Ontario and Quebec. Some of the deposits are probably unexcelled anywhere. The corundum deposits of Eastern Ontario are unique. Gold has been mined in Eastern Ontario and in the Lake of the Woods district. Feldspar and pyrite mining is important. In the far north, explorers report occurrences of much the same minerals as known along the southern fringe of the Laurentian plateau.

The Arctic Archipelago. The islands of the Arctic archipelago extend from the north side of Hudson Bay and Hudson Strait for a distance of 1,500 miles, while their greatest extension east and west is along the 73rd parallel, a distance of 500 miles. The total area of these northern islands is well over 500,000 square miles, of which Baffin Island, the largest, occupies about 200,000 square miles.

Though naturally much diversified in their physical aspects, the Arctic Islands are characterized in the east, in Baffin, North Devon and Ellesmere Islands by a general tableland rising to elevations of 2,000 to 3,000

feet, but increasing in the north-eastern part of Baffin Island to 5,000 feet, with hills rising perhaps one or two thousand feet higher, while in the northern part of Ellesmere Islands isolated mountain peaks reach nearly to 5,000 feet. Westward of Ellesmere Island the general elevations of the islands of the Parry and Sverdrup groups lie below 1,000 feet. The large islands lying along the border of the continental land, south of the preceding groups and west of Baffin Island, have general elevations of usually less than 500 feet, though in the westernmost island, Banks Island, the general elevation is above 1,000 feet, while the southern part reached an altitude of 3,000 feet.

The greater part of Baffin Island is occupied by pre-Cambrian rocks resembling those of the Labrador peninsula, which extend on northward through North Devon and Ellesmere Islands. Virtually, the pre-Cambrian rocks of Baffin and the adjoining islands to the west occupy an area which, with the U-shaped Laurentian plateau, entirely encloses Hudson Bay.

Save in the extreme north, on Ellesmere Island where Cambrian rocks passing up into Ordovician rest on the pre-Cambrian, there is usually a considerable time break in the geological sequence between the ancient crystalline rocks and the earliest Palaeozoic measures, usually of Ordovician age. Parts of the western portion of Baffin Island and of the islands to the west, including Victoria Island, are largely occupied by limestones of Ordovician and Silurian age. Banks Island still further west and the Parry Group to the north, and the islands north of Lancaster Sound, are occupied by Devonian and Carboniferous strata, as well as older formations, while the Sverdrup group is largely of Mesozoic strata. Isolated patches of lignite-bearing Tertiary beds occur on the coast of Baffin Island and elsewhere.

Mention may here be made of the extensive Palaeozoic basin of flat-lying measures bordering the southern

shores of Hudson Bay from the north of the Churchill River eastward to the foot of James Bay, a distance of about 800 miles. This relatively narrow basin extends south-westward of James Bay to within 120 miles of Lake Superior. South of James Bay the area is largely occupied by Devonian beds, with an interrupted fringe of Silurian and sometimes Ordovician measures. Westward of James Bay the strata are largely Silurian, bordered over considerable areas to the south by Ordovician. Palaeontological evidence suggests a former connection on the one hand with the Palaeozoic basin of the Arctic Islands, and on the other with the ancient inland sea at one time occupying Manitoba. Also, in the Devonian times at least, it seems probable that a Palaeozoic sea stretched southward from James Bay to the region of the Great Lakes.

Glaciation of Eastern Canada. Something may be added here on the events of the glacial period as affecting the eastern part of Canada as a whole, although many points connected with this particular period still remain uncertain and the subject of debate. Like the Scandinavian peninsula, the Laurentian plateau at one stage in the glacial period apparently became the seat of a great confluent ice-sheet, which, when at its maximum, flowed down from it in all directions in general conformity with its main slopes. Climatic conditions and relatively local physical features may have conspired to render the discharge of glacial ice more important in some directions than in others, and it is even possible that at no single time was the whole extent of the plateau equally ice-clad. To this continental ice-sheet the name Laurentian glacier has been given, and as there is reason to believe that at times, probably both at the beginning and near the close of the glacial period, there were two principal subordinate centres of distribution, one to the west, the other to the east of Hudson Bay; to these the

names Keewatin and Labradorian glacier have been given.

During the whole of this period the Laurentian plateau was in the main an area of denudation. From it the surface material was carried away in all directions, even to the northward, for there is absolutely no evidence that any "polar ice-sheet" ever trenched upon the continent of North America. The generally bare ice-scored rocky surface of these highlands is evidence of this denudation, while the existence of broken, angular masses of unmoved local debris in the central part of Labrador and in the central area of the Keewatin glacier shows that across these neutral gathering-grounds no ice ever passed.

As to the distance to which the solid glacier-ice came southward from the Laurentian plateau, the evidence with respect to the Labradorian glacier is yet inconclusive. Neither is it certain at how many times or to what extent the glacial period was interrupted by relatively warm epochs, but it may be stated that the flora of at least one of these interglacial epochs, as represented in the vicinity of Toronto, is such as to indicate a climate fully as warm as that at present existing, during which it seems improbable that much, if any, glacier-ice could have persisted on the Laurentian highlands.

These problems cannot be discussed here, but it is certain that towards the decline of the glacial period, the region of the Great Lakes was occupied by a succession of fresh-water basins, presumably impounded by the northward, retreating edge of the continental glacier. The evidence of the former existence of these lakes is furnished by numerous beaches, such as the Iroquois and Algonquin beach; somewhat analogous, high-level beaches also exist in the valley of the lower St. Lawrence. As a result, southern Ontario is covered by deposits of till, glacial clays, glacial lake clays, etc.

After the final disappearance of the ice-sheet, the



Foothill Types, Alberta



Selkirk Types

eastern part of Canada, as a whole, stood at a relatively low level. Without quoting in detail the heights to which the sea is known to have reached at this time in various places, it may be stated that it invaded the St. Lawrence valley as far at least as Lake Ontario. Deposits holding marine shells of sub-arctic type have been found at Montreal to a height of 560 feet, and near Ottawa to a height of 470 feet. As a result of the circumstances noted, the St. Lawrence plain as far west as Ottawa, and nearly to Kingston on Lake Ontario, is deeply covered by deposits due to the glacial period, including boulder-clay, Leda clay, and an overlying Sazicava sand, the two last often full of fossil shells of the period. In the coastal regions of the maritime provinces similar deposits occur, to which the same names have been extended, but to the west, around the Great Lakes, no marine forms have been found.

Before leaving the subject it may be noted that it is doubtful if the Laurentide glacier in the east ever crossed the Gaspé peninsula. In New Brunswick and adjacent parts of the State of Maine, during some part of the glacial period, a separate, small gathering ground of ice existed, which has been called the Appalachian glacier. The Magdalen Islands, in the centre of the Gulf of St. Lawrence, appear never to have been glaciated, and it is at least a matter of doubt whether any ice, except that originating on the peninsula itself, ever passed over Nova Scotia.

The Interior Continental Plain. This is bounded on the west by the Rocky Mountains, running about north-north-west, and on the east by the edge of the Laurentian plateau, which, taking a more westerly direction than the mountains, causes the gradual narrowing of the intervening plain to the north. Thus on the 49th parallel, here constituting the southern boundary of Canada, the plain has a width of about 800 miles; but it is reduced to

less than 400 miles on the 56th parallel. North of the 62nd parallel it is greatly narrowed, the surface becomes more irregular, and is broken by several narrow mountain ranges paralleling the Rocky Mountains.

The southern part of the great plain is much the most important from an economic point of view, and is also that about which most is known. It includes the wide prairie country of the Canadian west, with a spread of about 193,000 square miles of open grass-land, an area more than twice that of Great Britain. Beyond the North Saskatchewan River the plain becomes essentially a region of forest, with only occasional prairie tracts, such as those of the Peace River valley. By chance, rather than by intention, the boundary line of the 49th parallel, to the west of the Red River, nearly coincides with the low watershed which separates the arid drainage-basin of the Missouri from that of the Saskatchewan and its tributaries, cutting off only 20,000 square miles from the Missouri slope. Another line, nearly coinciding with a second low, transverse watershed, may be drawn on the 54th parallel. The watershed crosses this line several times, but in the main it may be taken as dividing the Saskatchewan system of rivers from those of the Mackenzie and the Churchill. The belt of country comprised between these latitude lines is 350 miles wide, with a total area of about 295,000 square miles.

The whole interior plain slopes eastward or north-eastward, from the Rocky Mountains towards the foot of the Laurentian highlands, so that a line drawn from the base of the mountains near the 49th parallel to Lake Winnipeg shows an average descent of over five feet to the mile, fully accounting for the generally rapid courses of the rivers of the region. There are, however, in the area to the south of the 54th parallel two lines of escarpment or more abrupt slope, which serve to divide this part of the plain into three portions, and although such

a division is by no means definite, it may usefully be alluded to for purposes of description.

The first or lowest prairie-level is that of the Red River valley, of which the northern part is occupied by the Winnipeg group of lakes, its average elevation being about 800 feet above the sea, although gradually rising to the southward, along the axis of the valley, till it reaches a height of 960 feet about 200 miles to the south of the International boundary. Its area in Canada is about 55,000 square miles, including the lakes, and to the south of Lake Winnipeg it comprises some 7,000 square miles of prairie land, which to the eye is absolutely flat, although rising uniformly to the east and west of the river. This is the former bed of the glacial "Lake Agassiz," the sediments of which constitute the richest wheat lands of Manitoba.

The escarpment bounding the plain on the west begins at the south in what is known as "Pembina Mountain," and is continued northward in the Riding, Duck, Porcupine and Pasquia Hills, which overlook Manitoba and Winnipegosis Lakes, constituting the main eastern outcrop of the Cretaceous rocks of the plains. From this escarpment the second prairie-level extends westward to a second and nearly parallel marked rise, which, in general, is known as the Missouri Coteau. The area of this plain is about 105,000 square miles, of which more than half is open prairie. Its average elevation is about 1,600 feet, and its surface is more diversified by undulations and low hills and ridges than that of the last, while the river-valleys are often deeply cut as well as wide. The greater part of the surface is well adapted for agriculture, although in places the scarcity of trees constitutes a disadvantage. The character of the soil is also more varied than that of the lower plain.

The third and highest plain, lying between the last and the base of the Rocky Mountains, may be stated to have an average height of 3,000 feet, with an area,

between the parallels of latitude referred to, of about 134,000 square miles, of which by far the greater part is absolutely devoid of forest, its wooded area being confined to its northern and north-western edges, near the North Saskatchewan River or its tributaries. The surface of this plain is still more irregular than that of the last, and it is evident that both before and after the glacial period the denuding forces of rain and rivers have acted upon it longer and more energetically. Table-lands like those of the Cypress Hills and Wood Mountain must be regarded as outlying remnants of an older plain of the Tertiary period, and the slopes and flanks of such outliers show that similar processes of waste are still in operation, adding to the length and depth of the ravines and "coulees," by which the soft Cretaceous and Tertiary rocks are trenched. The deposits of the glacial period, with which even this high plain is thickly covered, have tended to modify the minor asperities resulting from previous denudation. The soil is generally good, and often excellent, but large tracts to the south and west are sub-arid in character; these, while suited naturally rather for pasturage than for ordinary agriculture, are easily rendered fertile by irrigation, and are also responding to the methods of "dry farming." Along the base of the Rocky Mountains is a belt of "foot-hills," forming a peculiar and picturesque region, of which the parallel ridges are due to the differing hardness of the Cretaceous rocks, here thrown into wave-like folds, as though crushed against the resistant mass of the older strata of the mountains.

Taken as a whole, the central plain of the continent in Canada may be regarded as a great shallow trough, of which, owing doubtless to post-Tertiary differential uplift, the western part of the floor is now higher in actual elevation than its eastern Laurentian rim. But although thus remarkably simple and definite in its grand plan, there are many irregularities in detail. The

second prairie-level has, for instance, some elevations on its surface as high as the edge of the third plain, both to the west and east of the valley of the Assiniboine River, which, again, is abnormally depressed. It is not possible here to do more than characterize its features in a general way.

Ever since an early Palaeozoic time, the area now occupied by the interior plain appears to have remained undisturbed, and to have been affected only by wide movements of subsidence or elevation, which, although doubtless unequal as between its different parts, have not materially affected the regularity of the strata laid down. Upon this portion of the continental platform, in its eastern parts on Lake Winnipeg and its associated lakes, Ordovician, Silurian and Devonian rocks are found outcropping along the stable base of the Laurentian plateau. Following this line of outcrop northward, the Devonian rocks gradually overlap those of older date and rest directly upon the pre-Cambrian. They continue to the Arctic Ocean and there occupy a great part of the Northern Archipelago. To the south of Athabasca Lake they rest, without any apparent angular unconformity, upon sandstones referred to very late pre-Cambrian or possibly Lower Cambrian, giving evidences in the stratigraphical hiatus of prolonged periods during Palaeozoic time in which land as well as water existed in some parts of the area. On the western side of the Great Plains the Palaeozoic strata reappear crumpled and broken in the Rocky Mountains, where the vast crustal movements of the Cordilleran belt found their inland limit.

These rocks consist for the most part, of pale-grey or buff, often magnesian, limestones along the eastern outcrop, and from them has been described an extensive and somewhat peculiar fauna. Some, at least, of the Palaeozoic formations represented probably extend

beneath the entire area of the Great Plains, but they are wholly concealed there by later strata of Cretaceous age, consisting chiefly of clay-shales and sandstones, generally but little indurated and flat-lying, or nearly so. The uniformity of the surface features of this country is principally due to that of these deposits, which, although since greatly denuded, have worn down very equally and have apparently never been very long subjected to waste at a great height above the base-level of erosion. The whole area has in fact been one rather of deposition than of denudation up to a time geologically recent, and has very lately been levelled up still further by the superficial deposits due to the glacial period.

The Cretaceous rocks are for the most part distinctly marine, although, beginning with the Dakota sandstones in the south, the tar-cemented sands on the Athabasca and elsewhere in the north-west, and the parallel beds, often of coarse material and in greatly increased volume, of the upturned measures of the Rockies, perhaps indicate river-born detritus won from the elevated western country.

In the eastern part of the plains, the Dakota sandstones are succeeded by the Benton shales, the Niobrara, largely calcareous and foraminiferal in some places, the Pierre shales and, lastly, the Fox Hill sandstones. These beds were probably all deposited in a shallow sea, spreading over the territory underlain by the Dakota measures. But further west in Alberta, during the interval represented by part of the Pierre and possibly the Niobrara, the country, over a wide extent, for a time was in a fluctuating state, so that brackish water and fresh water deposits, the Belly River formation, with beds of lignite, formed, but finally were again succeeded by marine deposits. The Dunvegan series of the Peace River, to the north, similarly characterized, is perhaps somewhat older. The Cretaceous strata in fact change very materially in composition and character

toward the Rocky Mountains, and when followed to the north give rise to the necessity for local names and render a precise correlation difficult in the absence of connecting sections over great tracts of level country.

All the Cretaceous strata so far referred to belong to the later stages of that system, but in the foot-hills the earlier Cretaceous is represented by the Kootanie formation, holding coal, and reappearing as in folds in the eastern ranges of the Rocky Mountains. One of these is followed by the valley of the Bow River between Banff and Canmore, and affords both anthracite and bituminous coal.

Overlying the Cretaceous rocks proper, in considerable parts of their extent, particularly in Alberta, are those of the Laramie, which, although perfectly conformable with the marine strata beneath, contain brackish water, and in their upper part entirely fresh water forms of molluscs, together with an extensive flora and numerous beds of lignite-coal or coal. As a whole, this formation may be regarded as a transition from the Cretaceous to the Tertiary, with a blending of organic forms, elsewhere considered as characteristic of one or the other. The lower parts are undoubtedly most nearly related to the Cretaceous, and particularly to the Belly River beds, which were laid down under similar physical conditions at an earlier stage. The remains of Dinosaurian reptiles are still abundant in these. The upper beds, constituting what was originally named the Fort Union group, with its local representatives under different names, is, on the contrary, more nearly allied to the Eocene. A still later stage in the Tertiary is represented by beds of Oligocene, found particularly as an outlier capping the Cypress Hills. These have afforded numerous mammalian bones, referred to the stage of White River beds of the Western States.

The aggregate thickness of the Cretaceous strata of the plains, so far as known, may in the eastern part be

stated as about 2,000 feet; in the west, in northern Alberta, it is about the same, but exceeds 2,500 feet in south-western Alberta, without including the Kootanie series of some 7,000 feet or more. The thickness of the Laramie is also great towards the Rocky Mountains, reaching probably 3,700 feet. The Pliocene (with perhaps the latter part of the Miocene) appears to have been a time of erosion only, in the area of the Canadian plains; wide, flat-bottomed valleys were cut out in the foothills, and to the east of these great tracts of country between the now outstanding plateaux must have been reduced to the extent of 1,000 feet or more in height.

The Interior plateau is pre-eminently an agricultural country; minerals are practically confined to the non-metallic substances. These, however, will give rise to important industries. The most important are the mineral fuels in the form of coals, lignite coals and natural gas, with which the plateau is richly supplied. These are obtained from the Cretaceous and Laramie rocks. The coal-bearing region of the north-west, between the International Boundary line and the 56th degree of latitude is approximately 65,000 square miles in extent. The Souris River country and the region about Medicine Hat yield lignite only. In western Alberta excellent lignite coals occur, which are being worked at a number of points. In the foot-hills adjacent to the mountains are many deposits of bituminous coal. Natural gas has been found in great quantity, particularly in the region about Medicine Hat, and also two hundred miles north of Edmonton. There is good evidence of the gas fields having a wide extent throughout this region. Great outcrops of Cretaceous sandstones saturated with tar or maltha occur along the Athabasca River, probably evincing the existence of important petroleum reservoirs. Salt springs occur on the borders of Manitoba Lake and in the Athabasca basin. Gypsum also occurs along the eastern outcrop of the Silurian and

Devonian rocks, and on the Peace River. Building stones are found, and clay suitable for brick and certain kinds of pottery. The Devonian limestones will probably prove important for cement-making in the East and North, as the Devonian Carboniferous of the Rockies have already begun to be.

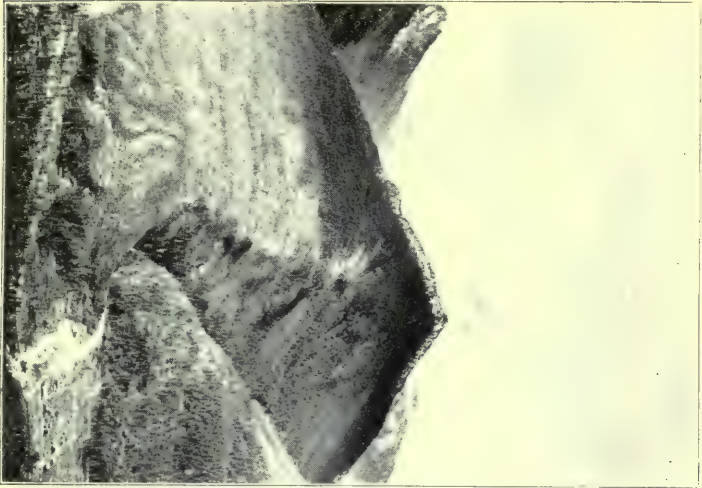
The Cordillera. Of this great mountainous region of the Pacific Coast, a length of nearly 1,300 miles, is included by the western part of Canada. Much of this is embraced in the Province of British Columbia, where it has a width of about 400 miles between the Great Plains and the Pacific Ocean. To the north it is continued in the Yukon district to the shores of the Arctic Ocean on one side, and on the other passes across the 141st meridian of west longitude into Alaska. Its strongly marked features result from enormous crustal movements parallel to the edge of the Pacific, by which its strata have at several periods, and along different lines, been crumpled, crushed and faulted. These movements having continued at intervals to times geologically recent, the mountains produced by them still stand high and rugged, with streams flowing rapidly and with great erosive power down steep gradients to the sea.

Although preserving in the main a general north-westerly trend, the orographic features of this region are very complicated in detail. No existing map yet properly represents even the principal physical outlines, and the impression gained by the traveller or explorer may well be one of confusion. Disregarding, however, all minor irregularities, two dominant mountain systems are discovered—the Rocky Mountains proper on the east, and the Coast Range of British Columbia on the west.

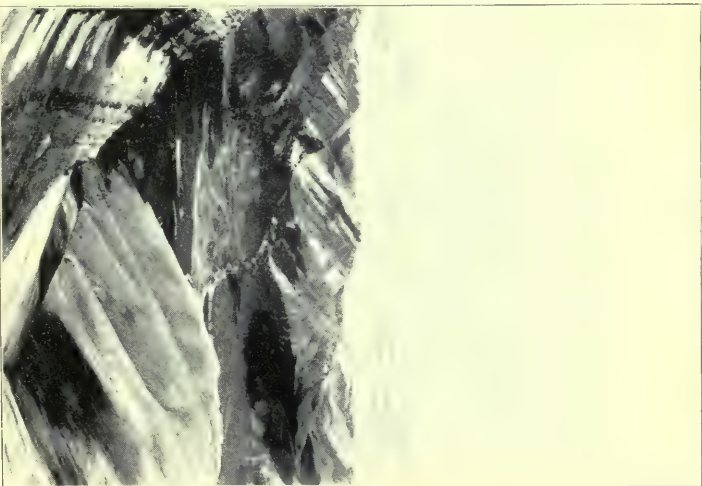
The first of these it has been proposed to name, from an orographic point of view, the “Laramide Range,” as it is essentially due to earth movements, occurring about

the close of the Laramie period, and rocks of that age are included in its flexures. Although not quite continuous (for there are two echelon-like breaks), this range, beginning two or three degrees of latitude to the south of the 49th parallel, forms the eastern member of the Cordillera all the way to the Arctic Ocean, which it reaches not far to the west of the Mackenzie delta. It is chiefly composed of Palaeozoic rocks, largely limestones, and where it has been closely studied, is found to be affected by series of overthrust faults, parallel to its direction, of which the easternmost separates it from the area of the Cretaceous foot-hills. Here the older rocks have been thrust eastward for several miles over the much newer strata. The structure has as yet been worked out in detail only along the line of the Bow River Pass. In width this range seldom exceeds sixty miles. The heights formerly attributed to some peaks appear to have been exaggerated, but any points in its southern part exceed 11,000 or 12,000 feet.

The Coast Range of British Columbia constitutes the main western border of the Cordillera. Beginning near the estuary of the Fraser River, it runs uninterruptedly northward, with an average width of about 100 miles, for at least 900 miles, when it passes inland beyond the head of Lynn Canal. This range is largely composed of granite and more basic plutonic rocks, with infolded masses of altered Palaeozoic and possibly later strata. It is not, as a rule, so rugged in outline as the last, but its western side, rising from the sea, shows the full value of its elevation there, while its main summits often exceed 8,000 or 9,000 feet. Several rivers rising in the plateau country to the eastward flow completely across this range to the Pacific, where the lower parts of their valleys, as well as those of many streams originating in the mountains themselves, in a submerged state constitute the remarkable system of fiords of British Columbia. Even in the arrangement of the islands adjacent to the



Selkirk Types, Trausverse Valley



Rocky Mountain Types

coast, the further extension of these valleys, and of others running with the range, may be traced, the evidence being of great subaerial erosion, when the land previously stood at a higher stage. The cutting out of these deep valleys probably began in Eocene times, but was renewed and greatly increased in the later Pliocene.

Outside the Coast Range, and in a partly submerged condition, lies another range, of which Vancouver Island and the Queen Charlotte Islands are projecting ridges. This stands on the edge of the Continental plateau, with the great depths of the Pacific beyond it. The rocks resemble those of the Coast Range, but include also masses of Triassic and Cretaceous strata which have participated in its folding, while horizontal Miocene and Pliocene beds skirt some parts of the shores.

In the inland portion of British Columbia, between the Coast and Rocky Mountain systems above particularly alluded to, are numerous less important mountain ranges which, while preserving a general parallelism in trend, are much less continuous. Thus, in travelling westward by the line of the Canadian Pacific Railway, after descending from the Rocky Mountain summit and crossing the Upper Columbia valley, the Selkirk Range has to be surmounted. Beyond this, the Columbia on its southern return is again crossed, and the Gold Range is traversed by the Eagle Pass before entering the Interior Plateau of British Columbia, which occupies the space remaining between this and the Coast Range. The system of ranges lying immediately to the west of the Rocky Mountains proper, notwithstanding its breaks and irregularities, is capable of approximate definition, and its components have been designated collectively the Gold Ranges. Further north it is represented by the Cariboo Mountains, in the mining district of the same name. The highest known summit of this system is Mount Sir Donald, 10,645 feet, one of the Selkirk Mountains. This mountain system is believed to be the

oldest in British Columbia. It comprises pre-Cambrian rocks with granites, and a great thickness of older Palaeozoic beds, much disturbed and altered.

The Interior Plateau region constitutes an important physical feature. Near the International Boundary it is terminated southward by a coalescence of rather irregular mountains, and again, to the northward, it ends about latitude $55^{\circ} 30'$ in another plexus of mountains without wide intervals. Its breadth between the margins of the Gold Ranges and the Coast Range is about 100 miles, and its length is about 500 miles. It is convenient to speak of the country thus defined as a plateau, because of its difference, in the large, from the more lofty bordering mountains. Its early Tertiary topography has been greatly modified by volcanic accumulations of the Miocene, and by river-erosion, while it stood at a considerable altitude, in the Pliocene ; but its plateau-like character is not obvious until some height has been gained above the lower valleys, where the eye can range along its level horizon-lines. It is highest to the southward, but most of the great valleys traversing it are less in elevation than 3,000 feet above the sea. To the north, and particularly in the vicinity of the group of large lakes occurring there, its main area is less elevated than 3,000 feet, making its average height about 3,500 feet.

Beyond this plateau to the north, the whole width of the Cordillera, very imperfectly explored as yet, appears to be mountainous as far as the 59th parallel of latitude, when the ranges diverge or decline, and in the upper basin of the Yukon, rolling or nearly flat land, at moderate elevations, again begins to occupy wide intervening tracts.

As a whole, the area of the Cordillera in Canada may be described as forest-clad, but the growth of trees is not luxuriant on the western slopes of each of the dominant mountain ranges, in correspondence with the

greater precipitation occurring on these slopes. This is particularly the case in the coast region and on the seaward side of the Coast Range, where magnificent and dense forests of coniferous trees occupy almost the whole available surface. The Interior Plateau, however, constitutes the southern part of a notably dry belt, and includes wide stretches of open, grass-covered hills and valleys, forming excellent cattle ranges. Further north, along the same belt, similar open country appears intermittently, but the forest invades the greater part of the region. It is only toward the Arctic coast, in relatively very high latitudes, that the barren Arctic tundra country begins, which, sweeping in wider development to the westward, occupies most of the interior of Alaska.

With certain exceptions the farming land of British Columbia is confined to the valleys and tracts below 3,000 feet, by reason of the summer frosts occurring at greater heights. There is, however, a considerable area of such land in the aggregate, with a soil generally of great fertility. In some of the southern valleys of the interior, irrigation is necessary for the growth of crops. Fruit growing is becoming one of the important industries.

The geological structure of the Cordillera is extremely complicated, and it has as yet been studied in detail over limited tracts only. There have been no appropriate terms of comparison for the formation met with, and these it has consequently been necessary to investigate independently by the light of first principle. The difficulty is increased by the abundance of rocks of volcanic origin referable to several distinct periods, resembling those of the Appalachian mountain region, though on a vastly greater scale, and, like them, almost entirely devoid of organic remains. The recognition, early in their investigation, has rendered it possible, however, to understand the main geological features,

which at first appeared to present an almost insoluble problem.

The oldest rocks recognized consist of crystalline schists probably of pre-Cambrian age, though possibly intricately associated with highly-altered Palaeozoic strata and metamorphosed igneous material. In the Gold Range and Interior Plateau region they have been distinguished as the Shuswap series. They include rocks lithologically resembling the Laurentian gneisses of the east, together with crystalline limestones, quartzites and gneisses like those of the Grenville series. In the Yukon, where similar rocks are widely developed, they have been grouped under the name of the Nasina series, held to be at least pre-Ordovician in age.

In the Rocky Mountains, Gold Ranges, and elsewhere is a great thickness of Palaeozoic rocks which, in the Rocky Mountain Range, towards the south, is underlain by a considerable volume of relatively unaltered, pre-Cambrian sediments. Cambrian fossils have been recovered from the lower Palaeozoic beds in the south, where the whole of the Cambrian is represented by highly fossiliferous measures, and again in the far north. West of the Rocky Mountains the Cambrian and, in general, the succeeding Palaeozoic systems, are largely represented by volcanic material. The Ordovician and Silurian, on the evidence in each case of a few characteristic fossils, are known to exist at several points in the Rocky Mountains proper. The Devonian has not been distinctly recognized.

In the Rocky Mountains, the Carboniferous is largely represented, chiefly by massive limestones, and the fossils found in these pass down to a stage which has been characterized as Devono-Carboniferous. No single trace of the flora of the Carboniferous period has yet been discovered in the western regions of Canada. In the Interior Plateau and along the Coast, the Carboniferous consists below of volcanic accumulations and quartzites

and above of limestones, some of which are largely foraminiferal.

The Triassic, in the southern part of the Rocky Mountains proper, is represented by red sandstones, the deposits of an interior Mediterranean of the period. To the west and north it becomes a marine formation, with peculiar fossils of the "Alpine Trias" type, but over large areas it consists almost entirely of contemporaneous volcanic accumulations.

The Jurassic occurs in the Queen Charlotte Islands and the Fernie shale, underlying the Kootanie formation in the southern portion of the Rocky Mountains, probably belongs to the same system. Rocks of earlier Cretaceous occur in places in the Rocky Mountains and throughout British Columbia as far as the coast, also northward to the Porcupine River, between latitudes 67° and 68°, in the Yukon District. Newer Cretaceous rocks are developed particularly in Vancouver Island, where they constitute the productive coal measures. In the Crow's Nest Pass region and elsewhere in the Rocky Mountains, as well as in the Queen Charlotte Islands, the earlier Cretaceous rocks contain abundance of good coal. All the strata of the Cretaceous period are more or less tilted and folded, and are evidently prior in date to the last great organic movements of the Cordillera. Evidences of contemporaneous volcanic action are again abundant in some parts of the extent of the Cretaceous.

Rocks referable to the Laramie or transition period between the Cretaceous and Tertiary, are found in the Yukon District and in the vicinity of the Fraser delta, holding lignite coals and numerous remains of plants. Beds assigned to the Oligocene and Miocene are also well developed in the southern part of the Interior Plateau of British Columbia, where the latter period has been an epoch of notable volcanic eruptions, producing both effusive and fragmental rocks, but toward the close flooding large tracts with basaltic flows. Traces of

similar volcanic activity, of the same date, are found in the Queen Charlotte Islands and in Vancouver Island. The Pliocene was chiefly a time of erosion, but deposits referred to this period are not entirely wanting.

Until the completion of the Canadian Pacific trans-continental railway, the west coast of Canada was a remote region, accessible with difficulty; but long before this coal has been successfully mined in Vancouver Island, and in 1858 and succeeding years the discovery and working of placer gold deposits brought the then isolated colony of British Columbia into considerable prominence. From the time of the quarrel with Spain on the Nootka question, in 1870, little had been heard of the region, which remained unprized and suffered naturally in consequence when the "Oregon" boundary was settled with the United States.

Lode mining may be said to have commenced about fifteen years ago. In 1893 the annual production of minerals in British Columbia had a value of about three and a half million dollars. It now runs in the neighborhood of twenty-five millions. The lead of Canada is obtained from the silver-lead mines of East and West Kootenay. Gold-copper ores are mined extensively at Rossland, and in the Boundary Creek district are enormous copper-gold deposits of the contact metamorphic type, which are worked on a gigantic scale. Copper is also found in many other parts of British Columbia, particularly along the Pacific Coast. Lode gold is mined in West Kootenay and the Similkameen.

The Cordilleran belt in Canada is not only rich in gold, silver, copper and lead, but it has enormous resources of coal of excellent quality, ranging from lignites to anthracite, conveniently situated. It is mined extensively in the Crow's Nest Pass, on Bow River, at Nicola, and on Vancouver Island. The great unprospected areas are known to contain the coal formation, and will no doubt when explored add greatly to the coal resources.

While well opened up along the southern fringe of the province, and to some extent along the coast, and while the main streams have been prospected for placer gold, the great part of the Cordilleran belt in Canada may be said to be as yet untouched and its potential wealth in minerals unknown, though it is certain to become one of the great mining countries.

Glaciation of Western Canada. Like the eastern part of Canada, the western has been largely affected by the events of the glacial period. Most of the superficial deposits can be explained only by reference to this period, and to it also the diversion of many rivers and streams and other important changes are due. It is not yet possible to give a connected account of these events, which will meet with general agreement, but, as in the east, the main facts have already been made sufficiently plain.

At an early time in the glacial period, the Cordillera, standing probably at a relatively high elevation, became covered by a confluent ice-sheet, extending approximately from latitude 48° to latitude 63° , with a total length at its maximum of some 1,200 miles. The form of the surface prevented the ice from discharging in all directions like that of Greenland, and forced the bulk of the outflow to move south-eastward and north-westward, in conformity with the direction of the ruling mountain ranges, from a central neutral gathering-ground or neve, situated approximately between the 55th and 59th parallels. The southward-moving portion of the great glacier filled the Interior Plateau of British Columbia, whilst its opposite extremity in the main flowed into the Yukon basin. Smaller streams from the main mass undoubtedly crossed the Coast Range by transverse valleys, to reinforce secondary, but large glaciers, which reached the sea to the south and north of Vancouver Island, while others extended through the Bow River valley

and similar depressions to the western margin of the Great Plains.

This Cordilleran glacier, as shown by late observations in the western part of the Great Plains, was the first to affect the region, and may perhaps prove to be the first notable ice-cap developed during the glacial period in North America. At a later time it became gradually very much reduced, but subsequently, at least once again extended to dimensions in some places approaching those first held by it. Rock striation and the transport of erratics, show that the southern part of the Cordilleran glacier, when at its maximum, passed uninterruptedly over projecting points between 6,000 and 7,000 feet in height above the sea.

In the area of the Great Plains, as above noted, the first recognized evidences of glacial conditions are those connected with the eastward spread of comparatively limited tongues of glacier-ice from the Rocky Mountains, and the deposit, on the western plains, of boulder-clay and rolled gravels attributed to what it has been proposed to name the Albertan stage. Subsequently at least two more distinct boulder-clays, separated by important interglacial deposits, have been laid down over the whole western part of the Great Plains, ending above in silty, sandy and gravelly beds, with large scattered superficial erratics. In connection doubtless with one of these boulder-clays is the remarkable monument of the glacial period known as the Missouri Coteau (crossed by the Canadian Pacific Railway, west of Parkbeg station). These later boulder-clays differ from those of the Albertan stage in being largely composed of debris of the Laurentian and Huronian rocks and Palaeozoic limestones found in places on the eastern side of the interior continental plain. The direction of transport of these erratics has been from the north-east or north north-east.

THE CLIMATE OF MANITOBA

By R. F. STUPART,

Director of the Meteorological Service.

THE Province of Manitoba is almost in the centre of the continent, about midway between the Atlantic and Pacific Oceans, and also midway between the Gulf of Mexico and the Arctic Sea. It is many hundreds of miles distant from any high mountains, and there are no important water areas to the westward. The topographical features of the province are not pronounced. About two-thirds of the total area, including the basins of Lakes Winnipeg and Manitoba, are at a level of less than one thousand feet, while to the westward the levels increase gradually to about sixteen hundred feet, with some few districts a little higher. Its highest uplands are the Porcupine Mts. between 52° and 53° N. (2,500 ft.), the Duck Mountain between 51° and 52° N., a portion of the Riding Mountain on about 51° (2,000 ft.), and a portion of the Turtle Mt. immediately north of the 49th parallel (2,300 ft.). To the northward and north-eastward of the province the levels fall away towards Hudson's Bay.

Such being, in brief, an outline of the geographical and topographical features of the province, it is not surprising that the climate is typically continental in its character and that such differences as exist between different districts are due chiefly to latitude, and the general meteorology of the zone within which the territory lies.

This zone, within which the other Western provinces are also situated, is one of peculiar interest from a meteorological standpoint, inasmuch as the trajectories of a large percentage of the cyclonic areas moving across

America lie within it, and the passing of these disturbances causes some very abrupt temperature changes. The fact also that the maxima of the winter mean pressure is in some years to the northward and in other years to the southward leads to very decided variability in the character of the winter season in different years, some instances of which will be given.

The very pronounced contrast between the continental and littoral type of climate is well evidenced by the fact that the mean range in temperature between the warmest and the coldest months of the year is 68° at Winnipeg, while it is but 21° at Victoria, British Columbia. The absolute recorded range of temperature at Winnipeg is 153° . A change of temperature of 40° in twenty-four hours is not very exceptional in winter in Manitoba, and a range of 49° has been registered. Very pronounced also are the departures from the normal in corresponding months in different years, there being a January on record with the mean temperature 8° above normal and another with the mean 13° below normal, and a February with a mean temperature 25° above normal and also one with the mean 13° below normal.

The monthly variations from normal are not so pronounced in summer, the mean temperature of the warmest July having been $70^{\circ}.2$ and of the coldest $60^{\circ}.6$.

As will be obvious from the figures just given, the change from winter to spring and summer is more rapid than in Great Britain or Western Europe, and frequently an April, which is wintry at the beginning, ends with conditions approaching those of summer. An average April is not so warm a month in Manitoba as it is in England. The season is not, however, so backward as the monthly mean temperatures might seem to indicate. The daily range is large, approximately 25° , and, while the nights are cold, the day temperatures are high; the frost soon leaves the ground and the farmer may commence sowing. The mean temperature of May is as high as in the south

of England, with the mean maximum considerably higher, and while frosts occasionally occur they are seldom severe. Light snowfalls also occasionally occur in this month, and at times are accompanied by high winds, but these storms are seldom injurious to agriculture.

The rapid upward trend of the temperature curve continues during June, the average daily maximum of which month is 74° at Winnipeg and 72° at Minnedosa. Warm days with frequent showers produce an almost phenomenally rapid growth, which continues through July, for which month the mean temperature at Winnipeg is 66° , with an average daily maximum of 78° . Few summers go by without several heat spells, during which the temperature rises to 90° or over, and in August, 1886, 103° was recorded in Winnipeg and 104° in the more western districts.

August shews a declining mean temperature after the middle of the month, and the last fortnight is a period of uneasiness among farmers, as it is known that in some years slight frosts have occurred, injuring such crops as were not yet fully ripe. Summer is, however, by no means over, and periods of exceedingly warm weather are not infrequent even in September; it is only occasionally that there are night frosts in that month. October is the true autumn month, during which the temperature curve begins its most rapid decline; and before its close severe frosts are of nightly occurrence, and on some days the temperature may not rise above the freezing point.

The winter may be regarded as of five months duration, viz., from November to the end of March. It is not usually, however, until the last week in November that the temperature falls to zero, and this occurs on a few days only, and it is seldom that zero is registered after March 25th.

January, with an average mean temperature of -3° , is

colder than February, but in both these months there are generally long spells of exceedingly low temperature, during which for days together the thermometer does not rise above zero. As an example of this, in January, 1883, on twenty-two days the temperature did not reach the zero point, and a minimum reading of -46° was recorded. This was, however, exceptional and in marked contrast to January, 1878, when there were only three days on which the temperature did not rise above zero, and minus readings were registered on but twelve days. The most exceptional winter month on record was February, 1878, when the mean temperature was 24° and the temperature fell below zero on but one day. In most years -40° is registered at least once during the winter; -46° has been recorded four times, and -50° was registered on December 24th, 1879.

The snowfall of Manitoba ranges from 52 inches in the eastern districts to 44 inches in the western districts, and while the ground is usually well covered from December to March, it is seldom that the depth is great. In most winters there are several heavy north-west gales succeeding the passage of cyclonic areas, and in these storms, as the temperature drops quickly, accompanied by a blinding drift of the dry snow, we have the well-known blizzard of the prairies.

Winter in Manitoba and in the Canadian West generally is not a season that is dreaded. It is, on the contrary, a season which, with its bright, dry, exhilarating atmosphere, is looked forward to with pleasure by most people. With the cold weather, bright sunshine, extreme dryness and lack of precipitation become the predominating features of the continental interior; 94 hours of sunshine in November and 88 in December increase to 111 in January and 137 in February. As with the increasing cold the humidity diminishes, the electric spark between the body and any conductor bears witness in a striking manner to the extreme dryness of the

atmosphere. The thin cirro-stratus cloud which frequently overspreads the winter sky when cyclonic areas are passing eastward across the western and north-western states is peculiarly productive of displays of parhelia ranging from the ordinary "Mock Suns" to the more intricate and beautiful phenomena which at times include several circles and prismatic colouring.

As might be expected from the general similarity of the face of the country, there are no wide differences in the monthly and annual amounts of precipitation in the different parts of the Province; the mean annual amount for the Province is about 19 inches, the heaviest, about 21 inches, occurring in the extreme eastern portion, and the least about 17 inches in the more southern and western districts. As, however, most of the precipitation, especially the summer rainfall, comes from local storms, there is sometimes a considerable difference in the amounts recorded at places not far distant from each other. Between 9 and 10 inches of rain, or approximately 50% of the total annual precipitation occurs between May and August and is nearly equal to the amount that occurs during the same period in Ontario and in the midland counties of England. At Winnipeg the greatest annual precipitation recorded was 29.24 inches in 1878 and the least 14.38 inches in 1886, in which year only 4.23 inches fell during the May to August period. Most of the summer rainfall occurs in thunderstorms, which at times are quite heavy, accompanied by violent squalls and, less frequently, by hail. It is but very seldom that these storms attain the energy of the tornado, which is not uncommon on the more heated prairies to the south.

Reference to Table II will show at a glance that Manitoba has plenty of sunshine, and that both summer and winter the percentage of the possible duration is larger than in the older Canadian Provinces or in Great Britain.

TABLE 1.—The average mean highest, mean lowest and mean temperature; the highest and lowest temperature and mean daily range; also percentage of cloud precipitation and sunshine, at various stations in Manitoba.

20 years 1888—1907.

WINNIPEG.

Lat. 49° 53', long. 97° 7'.

MONTH	MEAN				ABSOLUTE		Per cent. of cloud.	Precipitation.	Hours of sunshine.
	Highest.	Lowest.	Temperature.	Daily range.	Highest.	Lowest.			
January	8.0	-13.3	-2.6	21.3	41.8	-46.1	47	0.96	111
February	11.1	-13.4	-1.2	24.5	46.0	-46.5	42	0.70	137
March	26.2	3.0	14.6	23.2	61.8	-36.5	55	1.25	182
April	50.1	27.0	38.6	23.1	89.6	-12.8	49	1.51	204
May	64.2	37.8	51.0	26.4	93.6	14.0	53	1.91	255
June	74.2	49.9	62.1	24.3	100.5	21.0	59	3.62	257
July	77.6	54.0	65.8	23.6	95.8	35.5	50	3.33	286
August	75.4	50.3	62.9	25.1	97.0	30.3	51	2.04	257
September	65.8	41.8	53.8	24.0	99.0	17.0	54	1.93	176
October	51.8	30.9	41.3	20.9	84.8	-2.8	58	1.27	127
November	30.5	12.4	21.4	18.1	64.8	-33.4	57	1.16	94
December	16.8	-2.7	7.0	19.5	44.8	-39.1	53	0.74	88
Year			34.6		100.5	-46.5	52	20.42	2172

20 years 1888-1907.

MINNEDOSA.

Lat. 50° 15', long. 99° 50'.

January	10.5	-11.6	-0.8	22.1	46.0	-50.2	42	1.25	
February	12.4	-11.3	0.6	23.7	51.5	-52.2	45	0.88	
March	26.8	3.1	14.9	23.7	66.2	-37.0	53	1.27	
April	49.4	26.0	37.7	23.4	82.5	-14.7	54	1.18	
May	62.9	36.4	49.7	26.5	96.1	9.4	55	2.02	
June	71.8	47.3	59.6	24.5	103.8	22.5	60	3.37	
July	76.3	51.1	63.7	25.2	97.8	32.7	51	2.67	
August	74.7	48.0	61.3	26.7	102.8	24.5	49	2.08	
September	65.1	39.4	52.2	25.7	97.0	11.2	53	1.53	
October	51.7	29.5	40.6	22.2	82.8	1.8	60	1.22	
November	30.7	11.6	21.1	19.1	65.8	-32.8	55	1.59	
December	19.4	-1.3	9.1	20.7	47.1	-37.0	49	1.02	
Year			34.2		103.8	-52.2	53	20.13	

18 years 1890-1907.

BRANDON.

Lat. 49° 51', long. 99° 57'.

January	8.8	-14.1	-2.7	22.9	43.5	-47.2		0.91	107
February	10.8	-13.2	-1.2	24.0	47.6	-52.0		0.87	132
March	25.6	2.0	13.8	23.6	60.0	-41.9		0.85	158
April	50.9	26.1	38.5	24.8	88.4	-11.7		0.81	158
May	64.6	36.4	50.5	28.2	99.3	7.0		1.81	229
June	72.9	47.0	60.0	25.9	106.3	26.3		3.42	223
July	77.8	50.5	64.2	27.3	99.5	33.0		2.44	274
August	75.9	47.9	62.2	28.0	106.5	29.5		2.51	252
September	66.4	38.6	52.5	27.8	95.6	10.6		1.46	174
October	52.9	27.7	40.3	25.2	81.6	-3.0		0.88	130
November	30.3	8.9	19.6	21.4	69.1	-40.7		0.86	89
December	17.7	-4.8	6.5	22.5	49.1	-40.9		0.63	86
Year			33.7		106.5	-52.0		17.45	2012

TABLE II.—Showing the average number of hours of bright sunshine and also the percentage of the possible, in each month and for the year, at various stations in Canada and Great Britain.

STATION	January		February		March		April		May		June		Year	
	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.
WINNIPEG	111	42	137	49	182	49	204	49	255	53	257	53	2172	49
BRANDON	107	41	132	47	158	43	158	38	229	48	223	46	2012	45
TORONTO	79	27	108	37	149	40	193	47	221	59	256	56	2049	46
QUEBEC	82	30	101	36	150	41	160	40	197	42	182	39	1723	38
EDINBURGH	31	13	56	21	93	26	122	29	164	33	152	29	1156	26
YORK	30	12	57	21	102	28	136	33	178	35	176	35	1276	29
OXFORD	48	19	66	24	113	31	151	37	195	41	193	39	1498	34
TORQUAY	59	23	75	27	140	38	175	43	228	48	231	48	1731	39
	July		August		September		October		November		December			
	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.	Hours	Per cent.
WINNIPEG	286	58	257	58	176	47	127	38	94	35	88	35	2172	49
BRANDON	274	56	252	57	174	46	130	39	89	33	86	34	2012	45
TORONTO	280	60	252	58	210	56	149	44	88	31	64	23	2049	46
QUEBEC	204	43	215	49	154	41	134	39	70	25	71	27	1723	38
EDINBURGH	141	28	146	32	102	27	81	26	44	18	21	10	1156	26
YORK	178	35	151	33	120	32	84	26	39	16	25	11	1276	29
OXFORD	203	41	185	42	145	39	101	31	57	22	41	17	1498	34
TORQUAY	223	46	210	47	161	43	110	34	66	25	53	22	1731	39

FLORA OF MANITOBA

INTRODUCTORY REMARKS

By A. H. REGINALD BULLER, D. Sc., Ph D.,

Professor of Botany in the University of Manitoba.

THE Flora of Manitoba up to the present has been studied but very little, so that it is not yet possible to present any adequate account of the Algae, Fungi, Liverworts, or Mosses. The first list of Phanerogamia and Pteridophyta was compiled for this hand-book by the late Rev. Canon Burman, whose death occurred on January 30th of this year. Canon Burman, who was born in Yorkshire, England, came out to Manitoba whilst still a young man, and lived in the Province for more than thirty years. During this time he gradually obtained a unique acquaintance with the flora, and last year was induced to compile a list of the Phanerogamia and Pteridophyta. Unfortunately his illness prevented any revision of the list. Canon Burman was perhaps the only man in Manitoba who possessed a comprehensive knowledge of the local flora, and the Province could ill afford to lose him. His death is particularly regretted in view of the visit of the British Association to Winnipeg.

A few plants not recorded by Canon Burman were found by Mr. C. W. Lowe last summer. They have been included in the list, and are marked with an asterisk.

THE PHANEROGAMIA AND PTERIDOPHYTES OF MANITOBA

By the late REV. W. A. BURMAN,

Of St. John's College, Winnipeg.

IN presenting the following list of Manitoba Plants, no claim is made to completeness. There is a large amount of work yet to be done within the bounds of the Province as at present constituted; while, with the extension of the boundaries to Hudson's Bay, doubtless the flora will be enriched by the discovery of many sub-Arctic species. Most of the Plants included in the present list were collected by the writer. The remainder have been added from the records of Dr. G. Macoun and Mr. G. M. Macoun of the Geological Survey, and chiefly consist of species collected in the extreme North-Western part of the Province.

The nomenclature adopted is that used in the catalogue of plants issued by the Geological Survey of Canada, which gives a very full list of synonyms; for the sake of economising space, the authors of the nomenclature used have not been named.

For the study of Plant distribution, the Province may be divided into four districts:

(1) EASTERN DISTRICT. This extends from the Eastern shore of the Lake of the Woods almost to the Red River, and includes a number of small lakes which are drained by the Winnipeg River. The rocks towards the Eastern side of the district belong to the Laurentian and Huronian formations, but towards the West they gradually disappear and are succeeded by fine lacustrine deposits of glacial age.

In the Southern part of the district occur a number of sandy ridges, which are covered with "Jack" pine and poplar. The intervening areas are largely occupied by swamps, in which the prevailing trees are Tamarac, Spruce and Poplar.

Towards the extreme West the woods become replaced by open, low-lying prairie, which forms part of the fertile Red River Valley. Further North there is a strip of park-like country, about 50 miles in width, in which occur occasional exposures of limestone, as at Tyndall, and deposits of Glacial Drift. Still further North, the Laurentian system dips beneath the waters of Lake Winnipeg and forms the Eastern shore.

The Eastern District is marked by the final occurrence toward the West of a good many species of plants belonging to Western Ontario, the Winnipeg River valley being roughly the Westerly limit of their distribution. Here the white and red pine disappear, also **Acer spicatum** and **Pirus Americana**, along with a number of herbaceous plants affecting rocky uplands.

(2) THE NORTH-WESTERN DISTRICT. This district sweeps away from the Red River, North of Winnipeg, to the North-Western corner of the Province. It is extensively wooded, its forests consisting of poplar, birch and spruce, accompanied by willows and bog-plants. At intervals it is broken up by extensive inter-glades of lowlands, which produce a large number of species of grasses and sedges. Its extreme North-Western division is an interesting region, in which occur the Riding, Duck and Porcupine Mountains, with which are associated many lakes and rivers. We here find a good many plants which also occur towards the East.

(3) THE SOUTH-WESTERN DISTRICT. This includes the rising ground which once provided the Western shores of the so-called old Lake Agassiz. The various elevations, such as the Pembina and Turtle Mountains,

ultimately became the first prairie plateau, and present a flora characteristic of the high prairie regions. In the extreme West of the Province are even found types belonging to the semi-arid regions further West. Examples are: *Mamillaria vivipara*, *Opuntia Missouriensis*, *Artemisia frigida*, and *Oxytropis splendens*. The series of ridges known as the Pembina Mountains are especially interesting, for they produce both lowland and upland types and also yield a few rarities such as *Sanguinaria Canadensis*. The Assiniboine River and its tributaries drain a large part of this plateau, and the valleys, particularly that of the Assiniboine—deeply cut through the elevated prairie—furnish a varied and profitable field for systematic work.

(4) THE CENTRAL DISTRICT. This covers the alluvial region of the Red River Valley. Included within it are the low-lying lands on both sides of the Red River, which extends Westward up to the foot of the Pembina Mountains and the other elevations to the North of it. This district has its characteristic flora, a marked feature of which is the large number of species of Compositae. Winnipeg comes within this district. A few miles North of the city is the limestone ridge known as Stony Mountain. Although its elevation is inconsiderable, the rocky substratum furnishes conditions favourable to the growth of a number of species differing greatly from those on the plain a few feet below. Among them are some which are not common in any other part of the Province, such as *Gerardia tenuifolia*, *Boltonia asteroides*, *Bouteloua racemosa*, and the curious little fern *Pellaea atropurpurea*, which is found on the exposed limestone boulders. Within the bounds of the City of Winnipeg is located the Northern limit for the occurrence of *Amorpha Gruticosa*, which, so far as the writer knows, is confined entirely to the Red River Valley, down which it has travelled from Dakota.

It only remains to be added that beyond the Orders covered by the accompanying list very little work has been done in collecting and recording the plants of Manitoba. The Thallophyta and Bryophyta have been practically left untouched, and offer an inviting field for future investigation.

PHANEROGAMIA

ANGIOSPERMAE

DICOTYLEDONES

Ranunculaceæ:

Clematis Virginiana, Linn.

Anemone patens.

nemorosa.

cylindrica.

Virginiana.

multifida.

dichotoma.

Thalictrum dioicum.

purpurascens.*

sparsiflorum.

Myosurus minimus.

Ranunculus aquatilis, var. *tricophyllus*.

var. *stagnatilis*.

multifidus, var. *repens*.

Cymbalaria.

rhomboideus.

abortivus.

acris.

Pennsylvanicus.

repens, var. *hispidus*.

Macounii.

scleratus.*

Caltha palustris.
Aquilegia Canadensis.
Actaea alba.
 spicata, var. *rubra*.

Menispermaceæ:

Menispermum Canadense.

Nymphaeaceæ:

Nymphæa odorata.
 Nuphar adverna.
 pumilum.

Sarraceniaceæ:

Sarracenia purpurea.

Papaveraceæ:

Sanguinaria Canadensis.

Fumariaceæ:

Corydalis glauca.
 aurea.

Cruciferæ:

Nasturtium palustre.
 Arabis lyrata.
 hirsuta.
 Holbeolii.
 retrofracta.
 Drummondii.
 Barbarea vulgaris, var. *stricta*
 Erysimum cheiranthoides.
 asperum.
 parviflorum.
 Sisymbrium canescens.
 incisum, var. *Hartwegianum*.
 Brassica Sinapistrum.
 campestris.
 Draba incana.
 nemorosa.
 Alyssum calycinum.
 Vesicaria Ludoviciana.
 Camelina sativa.

Capsella Bursa,—pastoris.

Thlaspi arvense.

Lepidium sativum.

intermedium.

Cappardaceæ:

Cléome integrifolia

Cistaceæ:

Helianthemum Canadense.

Violaceæ:

Viola blanda.

cucullata.

delphinifolia.

canina, var. sylvestris.

var. adunca

Canadensis.

pubescens.

Nuttallii.

Polygalaceæ:

Polygala verticillata.

Senega.

Caryophyllaceæ:

Silene antirrhina.

noctiflora.

Lychnis Drummondii.

Githago.

Saponaria vaccaria.

Arenaria Michanii.

Stellaria longifolia.

longipes, var. minor.

Cerastium nutans.

arvense.

Sagina nodosa.

Spergularia media.

Paronychiceæ:

Paronychia sessiliflora.

Portulacaceæ:

Portulaca toleracea.

Hypericaceæ:

- Hypericum ellipticum
mutilum.
Canadense
Ascryon.*
Elodes Virginica.

Malvaceæ:

- Malva rotundifolia.
Malvastrum coccineum

Tiliaceæ:

- Tilia Americana.

Linaceæ:

- Linum sulcatum.
rigidum.
perenne.
usitatissimum.

Geraniaceæ:

- Geranium Carolinianum.
Robertianum.
Herodium cicutarium.
Impatiens fulva.
Oxalis corniculata, var. stricta.

Celastraceæ:

- Celastrus scandens.

Rhamnaceæ:

- Rhamnus alnifolia.

Vitaceæ:

- Vitis cordifolia.
Ampelopsis quinquefolia.

Sapindaceæ:

- Acer spicatum.
Negundo aceroides.

Anacardiaceæ:

- Rhus toxicodendron.

Leguminosæ:

- Thermopsis rhombifolia
Trifolium pratense.

- Trifolium repens.
Melilotus alba.
 officinalis.
Medicago lupulina.
 sativa.
Hosackia Pursliana.
Psoralea argophylla.
 esculcuta.
Amorpha canescens.
 fruticosa.
 microphylla.
Petalostemon candidus.
 violaceus.
Glycyrrhiza lepidota.
Astragalus caryocarpus.
 adsurgens.
 hypoglottis.
 aboriginorum.
 bisulcatus.
 pectinatus.
 flexuosus.
 multiflorus.
 Canadensis.
Oxytropis campestris
 Lamberti.
 splendens.
 deflexa.
Hedysarum boreale.
Desmodium Canadense.
Vicia Americana.
Lathyrus venosus.
 palustris.*
 maritimus.*
 ochroleucus.
Amphicarpæa monoica.

Rosaceæ:

- Prunus Americana,
 - pumila.
 - Pennsylvanica.
 - Virginiana.
- Spiræa salicifolia.
- Rubus Chamæmorus.
 - articus.
 - triflorus.
 - strigosus.
- Geum strictum.
 - rivale.
 - triflorum.
- Chamærhodos erecta.
- Fragaria Virgiana.
 - vesca.
- Potentilla arguta.
 - Norvegica.
 - rivalis, var. millegrana.
 - Hippiana.
 - effusa.
 - argentea.
 - palustris.
 - fruticosa.
 - Anserina.
- Agrimonia Eupatoria
- Rosa blanda.
 - Arkansana.
- Pyrus Americana.
- Crataegus coccinea.
- Amelanchier alnifolia.

Saxifragaceæ:

- Saxifraga tricuspidata.
- Mitella diphylla.
- Heuchera hispida.
- Parnassia palustris.

Ribes oxyacanthoides.
rubrum.
prostratum.
Hudsonianum.
floridum.

Droseraceæ:

Drosera Anglica.
linearis.

Haloraceæ:

Myriophyllum spicatum.
Hippuris vulgaris.

Onagraceæ:

Epilobium angustifolium.
coloratum.
palustre.
paniculatum.

Ænothera biennis.
albicaulis.
serrulata.

Caura coccinea.

Circaea alpina.

Cucurbitaceæ:

Echinocystis lobata.

Cactaceæ:

Mamillaria vivipara.
Opuntia Missouriensis.

Umbelliferæ:

Sanicula Marylandica.
Musenium divaricatum.

Carum Carui.

Thaspium trifoliatum.

Cicuta virosa.

Lium cicutæfolium.

Osmorrhiza longistylis.
*divaricata.**

Peucedanum fœniculaceum.

Heracleum lanatum.

Araliaceæ:

Aralia nudicaulis.

Cornaceæ:

Cornus Canadensis.
stolonifera.

Caprifoliceæ:

Sambucus Canadensis.

Viburnum Lentago.

pubescens.

Opulus.

Linnaea borealis.

Symphoricarpos occidentalis.

racemosus.

Lonicera Sullivantii.

glauca.

Diervilla trifida.

Rubiaceæ:

Houstonia purpurea, var. longifolia.

Galium trifidum.

triflorum.

boreale.

Compositæ:

Eupatorium purpureum.

perfoliatum.

Liatris scariosa.

punctata.

Gutierrezia Euthamiæ.

Grindelia squarrosa.

Chrysopsis villosa.

Haplopappus spinulosus.

Solidago humilis, var. B.

Missouriensis.

Canadensis.

rigida.

lanceolata.

Bellis perennis.

Townsendia sericea.

- Aster lævis.
 cordifolius.
 Lindleyanus.
 multiflorus.
 Salicifolius.
 Novi-Belgii.
 ptarmicoides.
 lutescens.
 pauciflorus.
 umbellatus.
 miser.
Erigeron cæspitosus.
 glabellus.
 Philadelphicus.
 strigosus.
 Canadense.
Antennaria plantaginifolia.
 dioica.
Anaphalis margaritacea.
Iva axillaris.
 xanthiifolia.
Ambrosia trifida.
 artimisiæfolia.
 psilostachya.
Xanthium Canadense.
Heliopsis scabra.
Rudbeckia hirta.
 laciniata.
 columnaris.
Echinacea angustifolia.
Helianthus rigidus.
 giganteus.
 annuus.*
 Maximiliani.
 Doronicoides.
Bidens frondosa.
 connata.

- Bidens cernua.
- Helenium autumnale.
- Gaillardia artista.
- Boltonia asteroides.
- Achillea Millefolium.
multiflora.
- Maruta cotula.
- Chrysanthemum leucanthemum.
- Matricaria inodora.
- Artemisia dracunculoides.
Canadensis.
cana.
Leudoviciana, var. gnaphalodes.
vulgaris.
biennis.
frigida.
Absinthium.
- Petasites sagittata.
- Arnica foliosa.
alpina.
- Senecio palustris.
lugens.
intergerimus.
aureus, var. Balsamitæ.
canus.
eremophilus.
Jacobæa.
- Arctium Lappa.
- Cnicus undulatus.
Drummondii.
arvensis.
- Cichorium Intybus.
- Crepis runcinata.
- Hieracium umbellatum.
- Troximon glaucum.
- Taraxacum officinale, var. alpinum.

Latuca pulchella.
 leucophæa.
Prenanthes alba.
 racemosa.
Sonchus oleraceus.
 asper.
 arvensis.
Lygodesmia juncea.

Lobeliaceæ:

Lobelia Dortmanna.
 spicata, var. *hirtella*.
 Kalmii.

Campanulaceæ:

Campanula rotundifolia.
 aparinoides.*

Vacciniaceæ:

Vaccinium Canadense.
Vitis-Idæa.
Oxycoccus vulgaris.
Chiogenes hispidula.

Ericaceæ:

Arctostaphylos Uva-Ursi.
Gaultheria procumbens.
Cassandra calyculata.
Cassiobe tetragona.
Andromeda prolifolia.
Kalmia glauca.
Ledum latifolium.
Pyrola secunda.
 elliptica.
 rotundifolia.

Monotropææ:

Monotropa uniflora.

Primulaceæ:

Primula farinosa.
 Mistassinica.
Androsace septentrionalis.

Dodecatheon Meadia.
Trientalis Americana.
Steironema ciliatum.
Lysimachia thyrsiflora.
Glaux maritima.
Centunculus minimus.

Oleaceæ:

Fraxinus viridis.

Apocynaceæ:

Apocynum androsæmifolium.
cannabinum.

Asclepiadaceæ:

Asclepias speciosa.
ovalifolia.
verticillata.
Acerates viridiflora.

Gentianaceæ:

Gentiana crinita.
serrata.
Amarella, var. acuta.
var. stricta.
affinis.
puberula.
Andrewsii.
alba.
Halenia deflexa.
Menyanthes trifoliata.

Polemoniaceæ:

Phlox Hoodii.
canescens.
Collomia linearis.

Hydrophyllaceæ:

Ellisia Nyctelea.

Borraginaceæ:

Heliotropium Curassavicum
Echinospermum deflexum.
Lappula.

Echinospermum Redowskii.
Eritrichium glomeratum.
Mertensia paniculata.
Lithospermum canescens.
 angustifolium.
Onosmodium Carolinianum.

Convolvulaceæ:

Convolvulus spithamæus.
 sepium, var. repens.
Cuscuta Gronovii.

Solanaceæ:

Solanum triflorum.
Physalis grandiflora.
 laneolata.

Scrophulariaceæ:

Pentstemon cristatus.
 acuminatus.
 confertus, var. cæruleo-purpureus.
 gracilis.
Mimulus ringens.
Gratiola Virginiana.
Veronica Americana.
 scutellata.
 peregrina.
Gerardia tenuifolia.
Castilleja coccinea.
 miniata.
 sessiliflora.
Orthocarpus luteus.
Pedicularis Canadensis.
 lanceolata.

Orobanchaceæ:

Aphyllon fasciculatum.

Lentibulariaceæ:

Utriculariavulgaris, var. Americana.
 intermedia.

Verbenaceæ:

Verbena hastata.
bracteosa.

Labiataë:

Mentha Canadensis.
Lycopus lucidus.
sinuatus.
Monarda fistulosa, var. *mollis.*
Lophanthus anistatus.
Nepeta glechoma.
Dracocephalum parviflorum.
Scutellaria lateriflora.
galericulata.
Brunella vulgaris.
Physostegia Virginiana.
Stachys palustris.

Plantaginaceæ:

Plantago major.
eriopoda.
decipiens.

Nyctaginaceæ:

Oxybaphus nyctagineus.
hirsutus.

Illecebraceæ:

Paronychia sessiliflora.

Amarantaceæ:

Amarantus retroflexus.
albus.

Chenopodiaceæ:

Monolepis chenopodioides.
Chenopodium album.
hybridum.
glaucum.
capitalum.
rubrum.
Axyris Amaranthoides.
Atriplex patula, var. *hastata.*

Atriplex Nuttallii
Salicornea herbacea.
Suaeda depressa.
Salsola Kali, var. tragus
Sarcobatus vermiculatus.

Polygonaceæ:

Erigonum flavum.
Polygonum aviculare.
 erectum.
 ramosissimum.
 tenue.
 incarnatum.
 lapathifolium, var. incanum.
 amphibium.
 Muhlenbergii.
 Persicaria.
 Convolvulus.
 dumetorum, var. scandens
Rumex occidentalis.
 Salicifolius.
 crispus.
 maritimus.

Aristolachiaceæ:

Asarum Canadense.

Elaeagnaceæ:

Elaeagnus argentea.
Shepherdia Canadensis.
 argentea.

Santalaceæ:

Comandra umbellata.
 pallida.
 livida

Euphorbiaceæ:

Euphorbia maculata.

Urticaceæ:

Ulmus Americana.
Humulus lupulus

Laportea Canadensis.*

Urtica gracilis.

dioica.

Parietaria Pennsylvanica.

Cupuliferæ:

Betula lutea.

papyrifera.

pumila.

Alnus incana.

Ostrya Virginica

Corylus rostrata.

Americana.

Quercus macrocarpa.

Salicineæ:

Salix candida.

cordata.

discolor.

longifolia.

lucida.

nigra.

rostrata.

Populus tremuloides.

balsamifera.

monilifera.

Empetraceæ:

Empetrum nigrum.

Ceratophylleæ:

Ceratophyllum demersum

MONOCOTYLEDONES.

Hydrocharidaceæ:

Elodea Canadense.

Orchidaceæ:

Microstylis monophyllos.

Ophioglossoides.

Calypso borealis.
Corallorhiza innata.
Listeria convallarioides.
Spiranthes Romanzoviana.
 gracilis.
Goodyera repens.
Orchis rotundifolia.
Habenaria bracteata.
 hyperborea.
 dilatata.
 obtusata.
 orbiculata.
 psycyodes.
Cypripedium parviflorum.
 pubescens.
 spectabile.
 candidum.

Iridaceæ:

Iris versicolor.
Sisyrhincium mucronatum.

Amaryllidaceæ:

Hypoxys erecta

Liliaceæ:

Smilax herbacea.
Asparagus officinalis.
Polygonatum giganteum.
Streptopus amplexifolius.
Smilacina stellata.
Maianthemum Canadense.
Allium cernuum.
 reticulatum.
Lilium Philadelphicum.
Disporum trachycarpa.
Clintonia borealis.
Trillium erectum, var. declinatus.
Lygadens elevans.

Juncaceæ:

- Juncus* *Balticus*, var. *montanus*.
 tenuis.
 longystylis.
 alpinus.
 nodosus, var. *genuinus*.
 var. *megacephalus*.

Typhaceæ:

- Typha* *lastifolia*.
Sparganium *eurycarpum*.
 minimum.

Aroideæ:

- Calla* *palustris*.
Acorus *Calamus*.

Lemnaceæ:

- Lemna* *trisulca*.
 minor.
 polyrrhiza.

Alismaceæ:

- Alisma* *Plantago*.
Sagittaria *variabilis*.

Naiadaceæ:

- Triglochin* *palustre*.
 maritimum.
Potamogeton *natans*.
 amplifolius.
 gramineus, var. *heterophyllus*.
 pusillus.
 mucronatus.
 marinus.
 pectinatus.
Zannichellia *palustris*.

Cyperaceæ:

- Heleveharis* *palustris*.
 tenuis.
 acicularis.
 pauciflora.

- Scirpus* pungens.
lacustris.
maritimus.
rufus.
- Eriophorum* alpinum.
vaginatum.
polystachyon.
- Carex* filifolia.
polytrichoides.
scirpoidea.
obtusata.
Baekii.
siccata.
disticha.
Douglasii.
Marcida.
teretiuscula, var. ramosa.
stipata.
rosea.
stenophylla.
festiva.
canescens.
areta.
Deweyana.
echinata, var. microstachys.
pratensis.
scoparia.
straminea, v.v.
alpina.
aurea.
flava.
aquatilis.
tetanica.
granularis.
Crawei.
Torreyi.
eburnea.

Carex *Pennsylvanica*.
 Assiniboinensis.
 longirostris.
 capillaris.
 rostrata, var. *utriculata*.
 Pseudo-Cyperus.
 trichocarpa varistata.

Gramineæ:

Beckmania erucæformis.
 Panicum capillare.
 Crus-galli.
 pauciflorum.
 Spartina cynosuroides.
 grecilis.
 Zizania aquatica.
 Andropogon provincialis.
 seoparius.
 Chrysopogon nutans.
 Phalaris arundinacea.
 Hierochloë borealis.
 Alopecurus geniculatus, var. *aristulatus*.
 Stipaspartea.
 viridula.
 Oryzopsis cuspidata.
 Muhlenbergia glomerata.
 Phleum pratense.
 Sporobulus cuspidatus.
 depauperatus.
 heterolepis.
 Agrostis scabra.
 Cinna pendula.
 Deyeuxia Canadensis.
 neglecta.
 Maccuniana.
 Ammophila longifolia.
 Deschampsia caespitosa.
 Avena fatua.

Avena pratensis, var. *Americana*.
striata.

Danthornia spicata.

Bouteloua oligostachya.
racemosa.

Phragmites communis.

Koeleria cristata.

Eatonia Pennsylvanica.

Distichlis maritima, var. *stricta*.

Dactylis glomerata

Foa cæsia.

compressa.

laxa.

pratensis.

serotina.

tenuiflora.

Glyceria arundinacea.

fluitans.

Festuca ovina.

rubra.

Bromus breviaristatus.

ciliatus.

Kalami.

Pumpellianus.

Lolium perenne.

Agropyrum caninum.

dasystachyum.

glaucum.

tenerum.

Hordeum jubatum.

Elymus Canadensis.

Virginicus.

PTERIDOPHYTA.

Equisetaceæ:

Equisetum arvense.
pratense.
palustre.
lævigatum.
variegatum.
scirpoides.

Ophioglossaceæ:

Botrychium Lunaria.
ternatum.
Virginianum.*

Filices:

Polypodium vulgare.
Pellæa atropurpurea.
Pteris aquilina.
Asplenium Filix-foemine.
Phegopteris polypodioides.
Dryopteris.
Aspidium Thelypteris.
cristatum.
marginale.
spinulosum.
fragens.
Cystopteris fragilis.
Onoclea Struthiopteris.
sensibilis.
Osmunda regalis.
cinnamomea.

Lycopodiaceæ:

Lycopodium annotinum.
complanatum.

Selaginaceæ:

Selaginella rupestris.

Marsileaceæ:

Marsilea mucronata.

GYMNOSPERMÆ.**Coniferæ:**

Thuja occidentalis.

Juniperus communis.

Sabina, var. *procumbens.*

Taxus baccata, var. *Canadensis.*

Pinus strobus.

resinosa.

Banksiana.

Picea nigra.

alba.

Abies balsamea.

Larix Americana.

FAUNA OF MANITOBA

(Mammals and Birds)

By ERNEST THOMPSON SETON,

Naturalist to the Government of Manitoba.

MANITOBA is 268 by 252 miles, or 74,448 square miles. It lies wholly within the great wheat belt of the north-west, but faunally speaking it is in the Temperate Region, partly in the Canadian Life-zone and partly in the Alleghanian portion of the Transition Zone. A line drawn from the south-east corner to the north-west corner would nearly demark these two zones. The *Canadian area*, north-east of this line, is nearly all forested. The prevailing trees being black spruce, white spruce and jack pine. The *Alleghanian area*, south-west of the line, comprises the prairies of the Province, and a considerable region of aspen forest.

Riding, Duck and Porcupine Mountains may be considered Canadian islands in the Alleghanian region.

MAMMALS OF MANITOBA

(The nomenclature is that of the United States Biological Survey.)

1. **Wapiti or Canadian Elk**, *Cervus canadensis* Erxleben. Formerly found in all the Alleghanian region of the Province. Reduced to a few stragglers twenty years ago, but since then, owing to good game laws, they have speedily increased and now furnish a regular supply of game. The estimated number of Wapiti in Manitoba to-day is 5,000.
2. **Northern White-tailed Deer**, *Odocoileus virginianus borealis* Miller. Unknown in the Province until

about thirty years ago, since then it has greatly increased, following the settlers; now found wherever there are settlements adjoining woods.

3. **Mule-deer**, *Odocoileus hemionus* (Rafinesque). Formerly abundant in all the Alleghanian Region; greatly reduced some twenty years ago, but now once more abundant in its proper region, wherever there is cover combined with broken ground.
4. **Moose**, *Alces americanus* Jardine. Abundant in all the forested area of the Province; apparently in no danger of extinction, since reasonable game laws have come in force. Several thousand are killed each year in the Province. The estimated total head of Moose within our limits is between 20,000 and 30,000.
5. **Woodland Caribou**, *Rangifer caribou* (Gmelin). Found only in the Canadian region, and nowhere common. It is more or less migratory, coming fifty to one hundred miles farther south for the winter.
6. **Prong-horned Antelope**, *Antilocapra americana* (Ord). Formerly found in all the prairies of the south-west. Recorded once or twice in early days very near Winnipeg; last seen on the Souris about 1881. Now extinct in the Province.
7. **American Bison or Buffalo**, *Bison bison* (Linnaeus). Formerly found in great abundance on all the prairies of Manitoba. Last seen wild near Winnipeg in 1819. Last great wild herd on the Souris 1867; the last wild individual on the Souris 1883.
8. **Red-squirrel**, *Sciurus hudsonicus* Erxleben. Abundant in every timbered portion of Manitoba, and active the year round.
9. **Eastern Chipmunk**, *Tamias striatus griseus* Mearns. Abundant in the woods of the south-eastern part of

the country and westward to Portage la Prairie. Hibernating during the winter.

10. **Little Chipmunk**, *Eutamias quadrivittatus neglectus* (Allen). Of general distribution in the southern half of the Province wherever there is timber and dry land. Exceedingly abundant, living like the preceding. Hibernating all winter.
11. **Franklin Ground-squirrel**, *Citellus franklini* (Sabine). Abundant in all the Alleghanian Region of Manitoba wherever there is woodland alternating with open sunny places. Like the rest of the Ground-squirrels it is quite omnivorous, but stores up only vegetable substances for bad weather supplies. It hibernates for six months of each year.
12. **Richardson Ground-squirrel**, *Citellus richardsoni* (Sabine). Exceedingly abundant on all the dry rolling prairies west of Pembina Mountain and south of Lake Manitoba extending up a little way in the Gilbert Plains country and the Upper Assiniboine. Hibernating all winter.
13. **Striped Ground-squirrel**, *Citellus tridecemlineatus* (Mitchill). Common on all the prairies of Manitoba, but much less so than in primitive times. Its burrow is so easily disturbed by the plow that cultivation is bound to exterminate it. It hibernates for six months of each year.
14. **Woodchuck**, *Marmota monax canadensis* (Erxleben). Found in all parts of the Province where there is dry woods, but nowhere abundant. More common probably about Duck Mountain than elsewhere. It hibernates for four or five months of the year.
15. **Canadian Flying-squirrel**, *Sciuropterus sabrinus* (Shaw). Common in all parts of the country. Some years very abundant, but rarely seen on account of its nocturnal habits. It is active all winter.

16. **Canada Beaver**, *Castor canadensis* Kuhl. Formerly very abundant in all parts of Manitoba. Reduced to very few some years ago, but owing to fostering laws it has since increased and may once more become plentiful.
17. **Common House-mouse**, *Mus musculus* Linnaeus. Introduced with settlers in 1882; now abundant in all towns.
18. **Grasshopper-mouse**, *Onychomys leucogaster* (Wied). Found only on the dry prairies at the extreme south-western corner of the Province.
19. **Arctic Deermouse**, *Peromyscus maniculatus arcticus* (Mearns). Abundant throughout the country wherever there is woods; especially fond of frequenting barns and outbuildings that are near the edge of the forest. Closely related to it, probably mere races, are the Prairie Deermouse (*bairdi*) found in the prairie regions and the plains, or Nebraska Deermouse (*nebrascensis*) found in the Souris country. True *maniculatus* should be found in western Manitoba.
20. **Red-backed Vole**, *Eutamias gapperi* (Vigors). Generally distributed throughout the Province, though nowhere abundant. It appears in two races, the bright colored, large prairie race (*loringi*) and the small dark race of the Canadian woods (*gapperi*).
21. **Drummond Vole**, *Microtus pennsylvanicus drummondi* (Audubon and Bachman). Abundant in all sedgy regions of the Province. A harmless species when not in excessive numbers, confining itself to lowlands overgrown with tall grass.
22. **Little Vole**, *Microtus minor* (Merriam). Generally distributed in the south-west or Alleghanian region, but nowhere very abundant.

23. **Muskrat**, *Fiber zibethicus* (Linnaeus). Found in great numbers wherever there is water throughout the Province. This animal is an important fur-bearer. Two million of its skins are shipped to London every year by the Hudson's Bay Company, representing of course the entire north-west. It lives in the water, and is rarely seen away from it except when forced to migrate.
24. **Northern Bog-lemming**, *Synaptomys borealis* (Richardson). Never actually taken in the Province, but recorded from surrounding localities which justify its inclusion. It is abundant in the far north, but not elsewhere common.
25. **Gray Pocket-gopher**, *Thomomys talpoides* (Richardson). Abundant on the high, dry prairies of Manitoba, but not extending very far into the woods. It is commonly called Mole by the residents, as it forced up mounds of earth in the fashion of the Mole. It is, however, a herbivorous rodent.
26. **Jumping-mouse**, *Zapus hudsonius* (Zimmermann). This extraordinary creature, famous for its long tail and its jumping habits, is found throughout Manitoba, except on the bare prairies. It appears in two forms. The typical Hudsonian, found in the Canadian forest, and the prairie form (*campestris*), a bright colored race peculiar to the woodland edges in the prairie portions of the south-west.
27. **Canada Porcupine**, *Erethizon dorsatum* (Linnaeus). Generally distributed in the Canadian area of Manitoba, but nowhere abundant. Its quills were formerly the favorite material for embroidery among the Indians, but in recent times the squaws have used glass beads in preference, so that the art is dying out.

28. **Snowshoe-hare or White-rabbit**, *Lepus americanus phaeonotus* Allen. Found in all parts of Manitoba wherever there is cover. In summer it is brown, in winter pure white. In Turtle Mountain it is represented by the race *bishopi*, distinguished by its short ears and pale color. The prevailing form in Manitoba is the dusky backed race (*phaeonotus*). This hare has long been noted for the excessive fluctuation of its numbers in cycles of seven to ten years. One hundred or more may be seen every day when its numbers are at its height, but usually the plague breaks out at this time and speedily reduces the Snowshoe population to near zero.
29. **Prairie-hare**, *Lepus campestris* Bachman. Formerly found only in the extreme south-west of the Province, and exceedingly rare; now abundant in all the prairie regions, especially in the vicinity of cultivated fields.
30. **Canada Lynx**, *Lynx canadensis* Kerr. Found in all the wooded parts of the Province, but varying greatly in numbers on different years.
31. **Kit-fox or Swift**, *Vulpes velox* (Say). Formerly common on the high dry prairie of the south-west; now exterminated within our limits.
32. **Royal Fox**, *Vulpes regalis* Merriam. Common on the prairies of the province; probably replaced in the woods by the form called *fulvus*. Less numerous than formerly.
33. **Gray-wolf or Buffalo-wolf**, *Canis occidentalis* Richardson. Generally distributed, but nowhere common.
34. **Prairie-wolf or Coyote**, *Canis latrans* Say. Abundant in all the south-western half of Manitoba; probably as numerous now as in the days before settlement.

35. **Canada Otter**, *Lutra canadensis* (Schreber). Found all along the rivers, but exceedingly rare now.
36. **Bonaparte Weasel**, *Putorius cicognanii* (Bonaparte). Common in most parts of the Province, but varying greatly in numbers on different years.
37. **Least Weasel**, *Putorius rixosus* Bangs. Nowhere numerous, but ranging over the whole Province. This is the smallest known beast of prey.
38. **Long-tailed Weasel**, *Putorius longicauda* (Bonaparte). Abundant in all the prairie region of Manitoba, etc.
39. **Mink**, *Putorius vison* (Schreber). Abundant throughout the Province wherever there is water and swamp.
40. **Spruce Marten**, *Mustela americana abieticola* Preble. Found only in the coniferous forest, and rare there.
41. **Pekan or Fisher**, *Mustela pennanti* Erxleben. Found only in the coniferous forest, and rare.
42. **Wolverene**, *Gulo luscus* (Linnaeus). Rare everywhere, but found in most of the heavily timbered parts of North-eastern Manitoba.
43. **Prairie Skunk**, *Mephitis hudsonica* Richardson. This large Skunk is abundant, especially in the half-wooded region.
44. **Common Badger**, *Taxidea taxus* (Schreber). Common in all prairie region, but not found in the woods; it is less common than before settlement.
45. **Raccoon**, *Procyon lotor* (Linnaeus). Very rare and confined to the south-western part of the Province, along rivers whose banks are heavily wooded.
46. **Grizzly-bear**, *Ursus horribilis* Ord. Now extinct in Manitoba, for perhaps 100 years. The records

show that at one time there were Grizzlies in all the Pembina Hills, Brandon Hills and Turtle Mountain regions.

47. **Black-bear**, *Ursus americanus* Pallas. Quite common yet in all parts of Manitoba where there is cover. Both black and brown phases occur in the same litter.
48. **Cooper Shrew**, *Sorex personatus* I. Geoffroy St. Hilaire. Generally distributed, and very abundant in some seasons.
49. **Richardson Shrew**, *Sorex richardsoni* Bachman. Apparently of general distribution, but not common I have records from Carberry, Shoal Lake, Norway House, etc.
50. **Hoy Shrew**, *Microsorex hoyi* (Baird). All of Manitoba falls within the known range of this species. Yet there is but one actual record, that from Red River Settlement.
51. **Marsh-shrew**, *Neosorex palustris* (Richardson). All Manitoba falls within its known range, but there are only two or three records. It is an inhabitant of marshes and river banks, nowhere common.
52. **Mole-shrew**, *Blarina brevicauda* (Say). Found only in the woods east of Winnipeg; common there.
53. **Star-nosed Mole**, *Condylura cristata* (Linnaeus). Recorded once from Winnipeg, but rare, and near the west end of its range at this point.
54. **Little Brown-bat**, *Myotis lucifugus* (Le Conte). All Manitoba falls within its known range. But I know of but one specimen taken within our limits; that I got from Poplar Point.
55. **Say Bat**, *Myotis subulatus* (Say). The accredited range of this Bat includes Manitoba, and the re-

cords nearly surround the Province, but it has not yet been taken in our limits.

56. **Silver-haired Bat**, *Lasionycteris noctivagans* (Le Conte). This species is commonly and generally distributed in Manitoba. It comes from the south about the vernal, and retires about the autumnal equinox.
57. **Big Brown-bat**, *Eptesicus fuscus* (Beauvois). There is a single Lake Winnipeg record for this species. Its proper range is to the southward, and Manitoba is its northmost limit so far as known.
58. **Red-bat**, *Lasiurus borealis* (Muller). The records show that this handsome bat is found in all the south-western part of the Province as a summer visitant.
59. **Hoary-bat**, *Lasiurus cinereus* (Beauvois). This fine species is found in all parts of Manitoba. It is somewhat common, and, like the rest of our Bats, is a migrant, never, so far as known, hibernating within our limits.

THE BIRDS OF MANITOBA

(The nomenclature used is that of the A.O.U. latest check list.)

1. **Swan-grebe, Western Grebe**. *Aechmophorus occidentalis*. Common summer resident in parts of the Alleghanian region, chiefly towards the north. Quite common at Shoal Lake, near Lake Manitoba, breeding in colonies in the marshes about Lake Winnipegosis. Very local in distribution.
2. **Silver-cheeked Grebe, Holboëll Grebe**. *Colymbus holboëlli*. Summer resident in Red River Valley.

Breeding in most of the large marshes of the Alleghanian portion of Manitoba.

3. **Horned Grebe.** *Colymbus auritus*. Abundant summer resident throughout the Province, April to October.
4. **American Eared-grebe.** *Colymbus nigricollis californicus*. A common summer resident in all the prairie region, but not yet found in the Canadian or north-eastern half of the Province.
5. **Pied-billed Grebe, Dabchick.** *Podilymbus podiceps*. Common summer resident in all parts of the Province where there are small ponds, from mid-April to October.
6. **Loon.** *Gavia immer*. Common summer resident on all the large lakes and rivers that are well supplied with fish.
7. **Red-throated Loon.** *Gavia stellata*. Rare; known only as a migrant.
8. **Long-tailed Skua.** *Stercorarius longicaudus*. In September, 1896, Samuel Slater brought to Alexander Calder of Winnipeg, in whose collection it now is, an immature Long-tailed Skua, shot on Lake Winnipeg. Its dimensions are: Length, $16\frac{1}{2}$ inches; wing 12 inches; tail, $6\frac{1}{2}$ inches; tarsus, $1\frac{3}{4}$ inches; middle toe and claw, $1\frac{3}{4}$ inches. All above sooty, except the neck, which is cream color, and crown, which is sharply blackish.
9. **American Herring-gull.** *Larus argentatus*. Abundant; of general distribution. Breeding in all the large lakes and prairie ponds. Arrives April 20.
10. **Ring-billed Gull.** *Larus delawarensis*. Common summer resident. Breeding in all the lakes and large prairie ponds.
11. **Franklin Gull, Rosy Gull.** *Larus franklini*. Abun-

dant; common summer resident, breeding in most of the large marshes of the Alleghanian region.

12. **Bonaparte Gull.** *Larus philadelphia*. Regular summer visitant. A few breed on the large lakes of the Province region.
13. **Forster Tern.** *Sterna forsteri*. Common summer resident; breeding about the larger lakes.
14. **Common Tern.** *Sterna hirundo*. Common summer resident on the large lakes, breeding with the preceding.
15. **Black Tern.** *Hydrochelidon nigra surinamensis*. Abundant summer resident everywhere, breeding in colonies on the prairie ponds. Arrives May 20; departs August 30.
16. **Double-crested Cormorant, Crow-duck.** *Phalacrocorax auritus*. Generally distributed, and breeding in colonies about the large lakes of the Alleghanian part of the country.
17. **American White Pelican.** *Pelecanus erythrorhynchos*. Apparently of general distribution, breeding about most of the lakes, chiefly west of Lake Winnipeg; less numerous than formerly.
18. **American Merganser, Sheldrake.** *Mergus americanus*. Common summer resident, breeding commonly in the rivers of the Lake Winnipegosis basin.
19. **Red-breasted Merganser, Fish-duck.** *Mergus serrator*. Common summer resident. Generally distributed, but breeding only in the northernly parts of the Province.
20. **Hooded Merganser.** *Lophodytes cucullatus*. Common summer resident of general distribution,

breeding wherever it finds hollow trees near the water.

21. **Mallard.** *Anas platyrhynchos*. Very abundant summer resident everywhere, breeding in all marshes. Arrives April 15; departs late in October.
22. **Black Mallard or Dusky Duck.** *Anas rubripes*. Very rare. Three or four specimens taken at Long Lake in four years. In my collection is a specimen from Shoal Lake, taken by Geo. H. Measham in 1901, and another taken near Winnipeg, by W. R. Hine. According to Measham, two more were shot at Shoal Lake in 1899. C. C. Helliwell reports one taken on Lake Manitoba in the fall of 1898.
23. **Gadwall.** *Chaulelasmus streperus*. Common, breeding about all the large lakes and the ponds of the prairie region.
24. **Baldpate or Widgeon.** *Mareca americana*. Summer resident. Not common, but generally distributed and breeding.
25. **Green-winged Teal.** *Nettion carolinense*. Abundant summer resident everywhere; breeding. Arrives April 20; departs in October.
26. **Blue-winged Teal.** *Querquedula discors*. Very abundant summer resident. Arrives late in April; departs early in October.
27. **Shoveller.** *Spatula clypeata*. Common summer resident everywhere. Departs late in October, like the other Ducks, when the frost seals the ponds.
28. **Pintail.** *Dafila acuta*. Common summer resident, breeding. Arrives late in mid-April; departs in October.

29. **Wood-duck.** *Aix sponsa*. A rare but regular summer visitant as far north as Lakes Winnipeg and Winnipegosis. I saw a pair taken at Carberry in 1883, and in 1886 got a male at Kenora. It is reported from Cook's Creek, Westbourne, Portage la Prairie, Lake Winnipegosis. Over a dozen were taken on the Souris River, about 25 miles south-west of Brandon, between 1882 and 1899, by H. W. O. Boger. Three were killed at Brandon by C. C. Helliwell, who saw also two on the roof of the town station, one day about 1890. G. H. Measham reports it rare at Shoal Lake, but one or two are seen there each year.

These, with previous records, completely spot the map of south-western Manitoba. The species is doubtless found throughout the Alleghanian region of the Province, as it has been recorded from Qu'Appelle and Cumberland House.

30. **Redhead.** *Marila americana*. Abundant summer resident of the Alleghanian region. Arrives in April; departs in October.
31. **Canvas-back.** *Marila vallisneria*. Generally distributed in the Alleghanian region and breeding, but nowhere common.
32. **American Scaup-duck, Big Blue-bill.** *Marila marila*. Common in spring and fall in all parts of Manitoba; a few may breed in the northern district. Arrives late in April; departs in October.
33. **Lesser Scaup-duck, Little Blue-bill.** *Marila affinis*. Very abundant summer resident in all parts of the Province. Breeds.
34. **Ring-necked Duck, Marsh Blue-bill.** *Marila collaris*. A rare summer resident. Reported from Winnipeg, Portage la Prairie, Waterhen River.

35. **American Golden-eye, Whistler.** *Clangula americana*. A common summer resident in all parts of Manitoba where there are large trees near water.
36. **Barrow Golden-eye.** *Clangula islandica*. "I shot a brace at Lake Manitoba in 1879, and a drake at Shoal Lake in the spring of the following year. And I saw a drake which was killed at the mouth of the Red River." (*R. H. Hunter*.)
37. **Bufflehead.** *Charitonetta albeola*. Common summer resident wherein there is timber and water. Arrives April 15; departs in October.
38. **White-winged Scoter.** *Oidemia deglandi*. Summer resident, breeding in marshy ponds. Found it quite common at Shoal Lake.
39. **Surf Scoter.** *Oidemia perspicillata*. Rare migrant; reported from Lake Winnipeg (*Hine*), Red River (*Hunter*), Nelson River (*Blakiston*).
40. **Ruddy Duck.** *Erismatura Jamaicensis*. A summer visitant; not common, erratic in distribution. Breeds in most of the large marshes.
41. **Blue Goose, Silver Brant.** *Chen caerulescens*. Noted as a rare migrant. Specimens taken at Winnipeg, Portage la Prairie and Brandon. At Fort Chipewyan, Lake Athabaska, where 10,000 or more geese were killed each autumn, only one of this species was taken in several years. This is now in my collection.
42. **Snow-goose, Wavey.** *Chen hyperborea*. Abundant spring migrant; less common in the fall. Arrives May 15, and again in October.
43. **Ross Goose.** *Chen rossi*. A specimen was taken on Red River near Winnipeg by Frank Marwood of that city, Sept. 20, 1902. It is now in the collection of Alexander Calder at Winnipeg.

44. **White-fronted Goose.** *Anser albifrons gambeli*. Rare, but regular migrant.
45. **Canada Goose, Wild Goose.** *Branta canadensis*. Abundant in the migrations. Arrives in April; departs late in October.
45. **Hutchins Goose.** *Branta canadensis hutchinsi*. A rare migrant or straggler. Taken on Red River by Kennicott, observed at Portage la Prairie by C. W. Nash, and noted at Brandon by C. C. Helliwell.
46. **Brant.** *Branta bernicla glaucogastra*. A rare migrant.
47. **Whistling Swan.** *Olor columbianus*. A rare migrant of general distribution.
48. **Trumpeter Swan.** *Olor buccinator*. A very rare migrant. George H. Measham secured three on Roseau River. A single specimen is in Manitoba Museum.
49. **American Bittern.** *Botaurus lentiginosus*. Common summer resident; of general distribution, especially about the extensive marshes of the Alleghanian region. Arrives the middle of April; departs in October.
50. **Least Bittern.** *Ixobrychus exilis*. Very rare summer visitant. On Nov. 9, 1907, E. W. Darbey showed me a Least Bittern, a young male, that was taken about Oct. 20 at Oak Point, Lake Manitoba, by J. C. McNab.

According to W. R. Hine, a specimen was shot in the Bishop's Marsh near St. Boniface in 1885 by Wm. Gordon (of Winnipeg). C. C. Helliwell has seen one or two about Oak Lake, Manitoba. Frank M. Chapman saw one at Shoal Lake, June, 1901.

51. **Great Blue Heron.** *Ardea herodias*. Generally distributed as a summer resident; nowhere common.

52. **American Egret.** *Herodias egretta*. In the summer of 1888, David Armit, an officer of the Hudson's Bay Company stationed at Manitoba House, while out shooting at Duck Bay, Lake Winnipegosis, came across and collected a fine adult specimen of this bird in breeding plumage. He has most generously sent the prize to me; it is now No. 1,776 of my collection. This is, I believe, the northernmost record for the species.
53. **Black-crowned Night-heron.** *Nycticorax nycticorax naevius*. Summer resident of general distribution in the Alleghanian region. I found it quite numerous and breeding in colonies at Shoal Lake. In other parts of the region it is somewhat rare.
54. **Whooping Crane.** *Grus americana*. Formerly common and breeding; now nearly extinct.
55. **Little Brown Crane.** *Grus canadensis*. Summer resident of general distribution; much less common than formerly. Arrives in mid-April; departs in September.
56. **Virginia Rail.** *Rallus virginianus*. Rare, but regular, summer resident of the Alleghanian region. The specimen in my collection was taken near Morden by D. Nicholson. I saw another in the collection of Geo. E. Atkinson of Portage la Prairie, and heard of another at Brandon. I have seen several taken near Winnipeg.
57. **Sora, Common Rail.** *Porzana carolina*. Abundant summer resident throughout Manitoba. Arrives May 1; departs in October.
58. **Yellow Rail, Water Sparrow.** *Coturnicops noveboracensis*. On the 13th of July, 1883, a specimen of this Rail was brought to me alive, by a farmer who caught it in a slough where he was cutting wild hay.

Being just then called away, I placed the bird in a coop, and on my return it was gone. But the record is, I believe, safe, as Preble found the species numerous at York factory, and there are other records to completely surround the Province.

59. **American Coot.** *Fulica americana*. Abundant summer resident. Arrives in mid-April; departs late in October.
60. **Northern Phalarope.** *Lobipes lobatus*. Rare straggler in migration; noted about Winnipeg only.
61. **Wilson Phalarope.** *Steganopus tricolor*. Common summer resident, breeding on most of the large ponds and marshes in the Alleghanian region.
62. **American Avocet.** *Recurvirostra americana*. While abundant in the adjoining Province of Saskatchewan, the species is a rare straggler in Manitoba.
R. H. Hunter writes: "I have killed the bird along the Souris, south-west of Plum Creek." In the Museum of the Geological Survey at Ottawa is a specimen of the Avocet, marked "from Manitoba." Shaw Cottingham killed nearly a dozen at a place 9 miles south of Brandon in 1899, and C. C. Helliwell got three or four out of a flock at Oak Lake, ten years before.
63. **American Woodcock.** *Philohela minor*. Very rare summer resident. At Winnipeg W. R. Hine reports that he got four during four years. At Portage la Prairie, one or two pairs seen each year by C. W. Nash. At Stuartburn, on Roseau River, George H. Measham shot one in 1891.
64. **Wilson Snipe.** *Gallinago delicata*. Abundant summer resident on all extensive bogs. Arrives April 20; departs September 30.
65. **Dowitcher.** *Macrorhamphus scolopaceus*. Abundant migrant in the western part of Manitoba.

66. **Stilt Sandpiper.** *Micropalama himantopus*. On August 29, at Carberry, I made the first positive capture of this species in the Province. It was in a mixed flock of Sandpipers of several species.
67. **Knot, Robin Snipe** *Tringa canutus*. Occasional migrant; noted along Red River and west of Brandon.
68. **Pectoral Sandpiper.** *Pisobia maculata*. A common migrant; noted along Red River.
69. **White-rumped Sandpiper.** *Pisobia fuscicollis*. Migrant; sometimes common, chiefly in western Manitoba.
70. **Baird Sandpiper.** *Pisobia bairdi*. Common migrant, chiefly in August.
71. **Least Sandpiper.** *Pisobia minutilla*. A common migrant in all the western part of the Province, especially during August.
72. **Red-backed Sandpiper, Blackheart.** *Pelidna alpina sakhalina*. Reported a common migrant along Red River (*Hine*) and at Portage la Prairie in fall (*Nash*). I have not seen a Manitoba specimen.
73. **Semipalmated Sandpiper.** *Ereunetes pusillus*. Generally distributed as a migrant; especially abundant in the country west of Red River.
74. **Sanderling.** *Calidris lucophaea*. Common migrant; recorded from Lake Winnipeg, Lake Manitoba, Portage la Prairie and Oak Lake.
75. **Marbled Godwit.** *Limosa fedoa*. Summer resident, frequenting the wet prairies near Winnipeg and on the plains of the Souris, etc. Formerly common, now becoming rare.
76. **Hudsonian Godwit.** *Limosa haemastica*. A rare migrant, chiefly along Red River and westward.
77. **Greater Yellow-legs.** *Totanus melanoleucus*. Abun-

dant migrant. Spring migration, late in April; fall, early in August.

78. **Yellow-legs.** *Totanus flavipes*. Abundant migrant in mid-May and in August.
79. **Solitary Sandpiper.** *Helodromas solitarius*. Common migrant, especially in fall; probably also it breeds.
80. **Western Willet.** *Catoptrophorus semipalmatus inornatus*. Common summer resident on all the wet prairies of south-western Manitoba.
81. **Bartramian Sandpiper, Prairie Plover.** *Bartramia longicauda*. In early days this was an extremely abundant summer resident on all the prairies of the Province. It has now become very scarce. Arrives May 7; departs August 30.
82. **Spotted Sandpiper.** *Actitis macularia*. Common summer resident. Arrives May 1, departing late in September.
83. **Long-billed Curlew.** *Numenius americanus*. Summer resident on the wet prairies of the Red River and on the Souris. Formerly common about Lake Manitoba, now rare.
84. **Black-bellied Plover.** *Squatarola squatarola*. Rare spring migrant; no autumn records.
85. **American Golden Plover.** *Charadrius dominicus*. Common spring and fall migrant. Affects burnt prairies and ploughed land. Spring migration, middle of May; fall, in August and September.
86. **Killdeer.** *Oxyechus vociferus*. Common summer resident throughout the Province. Arrives late in April; departs last of August.
87. **Semipalmated Plover, Ring-plover.** *Aegialitis semipalmata*. Rare migrant.
88. **Belted Piping Plover.** *Aegialitis meloda*. Some-

what common, migrant throughout the Province, and, according to Macoun, found actually breeding on Lakes Manitoba and Winnipeg.

89. **Turnstone.** *Arenaria interpres morinella*. A rare migrant. Goes north about May 15; returns about August 15.
90. **Spruce Grouse.** *Canachites canadensis*. Common permanent resident of all the Canadian or north-eastern half of the Province.
91. **Canadian Ruffed Grouse.** *Bonasa umbellus togata*. Common permanent resident of the Canadian portion of Manitoba.
- 91a. **Gray Ruffed Grouse.** *Bonasa umbellus umbelloides*. Abundant resident of the Alleghanian or south-western half of the country whereon there is woods.
92. **Willow Ptarmigan.** *Lagopus lagopus*. A common resident of the extreme northern parts of Manitoba, moving southward in winter as far as Shell River, Lake Manitoba and Shoal Lake.
93. **Prairie-hen.** *Tympanuchus americana*. In 1871 Dr. Coues wrote: "I have no reason to believe that it occurs at all in North-western Minnesota or Northern Dakota." In 1882, when first I visited Manitoba, the species was nearly unknown in the country, the only known specimen having been taken near Winnipeg in 1881. In 1883 W. R. Hine, informs me, it began to be common at Pembina. In 1884 it was not only common at Winnipeg, but had also for the first time made its appearance at Portage la Prairie, on the Assiniboine. In 1886 I first saw it at Carberry. Since then it has spread with cultivation, and is now abundant in all the settled parts.

94. **Columbian Sharp-tailed Grouse, Prairie Chicken.** *Pediocætes phasianellus columbianus*. Abundant resident everywhere, especially in the country west of Lake Winnipeg, north to the narrows of Lake Winnipeg, and thence eastward as far as Long Lake and Pic River, on Lake Winnipeg (*Bell*). This species lives by preference on the prairies in summer and in the wooded districts during winter, so that it is in a sense migratory.
95. **Passenger Pigeon.** *Ectopistes migratorius*. In 1885 I wrote as follows: "Common summer resident, probably everywhere, as it was noted on Riding Mountain, along the Assiniboine, on Big Plain, on Turtle Mountain (*Coues*) and northward, as well as all over the Red River Valley, throughout the Winnipegosis region. Often abundant during the migrations. I am not aware of the existence of any extensive 'rookeries.' Arrives early in May; departs in October."

In 1908 my notes on the species are: "The following are all the specimens I know of in Manitoba:—Adult male taken at Winnipeg in 1892, now in collection of Father Blain, St. Boniface College; adult male taken at Winnipeg in 1894 by E. Wilson, now in possession of J. K. Hardy of St. Boniface; adult male taken at Winnipegosis on 13 April, 1898, by J. J. G. Rosser."

The last year in which the Pigeons came to Manitoba in force was 1878. Next year they were comparatively scarce, and each year they have become more so. In the early eighties a few were seen each season. The above three specimens were the last reliable recorded. None have been seen since. It is interesting to note that 1878 was also the last year of the vast Buffalo herds on the Saskatchewan. In my collection are three specimens of Passenger

- Pigeon: young male taken at Carberry, Man., by Miller Christy, 30 Aug., 1883; adult male and female taken at Fort Holmes, Ind. T., U.S., by C. Dewar, Jan. 1889.
96. **Mourning Dove.** *Zenaidura macroura carolinensis*. Formerly far from common, now abundant in all parts of the Alleghanian region where there is timber, frequenting barnyards that are near the woods.
97. **Turkey Vulture.** *Cathartes aura septentrionalis*. Common summer resident of the prairie region, probably breeding here.
98. **Swallow-tailed Kite.** *Elanoides forficatus*. Geo. Grieve tells me that two have been taken at Winnipeg, one in 1889 and one in 1892, neither seen by me. I observed one in Minnesota, near Pembina, in 1883. Coues reports it as occasional at Pembina, and R. H. Hunter writes me that he has seen it at Selkirk, Pembina Mountain, and Fort Qu'Appelle.
99. **Harrier.** *Circus hudsonius*. Abundant summer resident. The adults, in blue plumage, are common in spring and fall. Arrives April 15; departs October 15.
100. **Sharp-shinned Hawk.** *Accipiter velox*. Common summer resident in all wooded regions. Arrives April 15; departs October 15.
101. **Cooper Hawk or Chicken Hawk.** *Accipiter cooperi*. May be entered as a rare summer resident. Reported by Hine and Hunter. I saw one at Edmonton, but do not know of a specimen taken in the Province.
102. **American Goshawk.** *Astur atricapillus*. Common fall and winter visitant, usually appearing in August. Not noted during the breeding season.

103. **Red-tailed Hawk.** *Buteo borealis*. Common summer resident of the wooded regions. Apparently complementary of the Swainson Hawk, which is found in more open country and on the prairie. Arrives April 15; departs October 15.
- 103a. **Krider Hawk.** *Buteo borealis krideri*. Three specimens of this beautiful Hawk have been taken at Winnipeg—one shot at Rosenfeld by Charles Stewart, Sept. 20, 1905; two now in the collection of A. Calder.
104. **Red-shouldered Hawk.** *Buteo lineatus*. R. H. Hunter writes me that he found this species in Eastern Manitoba.
105. **Swainson Hawk. Common Henhawk** *Buteo swainsoni*. Very abundant summer resident of the prairie region; breeds perhaps twice each season. Have seen several black specimens. Arrives April 15; departs October 15.
106. **Broad-winged Hawk.** *Buteo platypterus*. Regular summer visitant wherever there is woods. In my collection are two specimens, one collected near Winnipeg May 3, 1905, by Ashley Hine. It is reported from various parts of the Province where well timbered, and is generally distributed, though not abundant. A. Calder has a beautiful melanistic specimen, killed at Winnipeg, April, 1907.
107. **American Rough-legged Hawk.** *Archibuteo lagopus sancti-johannis*. Migrant; only seen in spring and fall, but not numerous.
108. **Red Roughleg, Gopher-hawk.** *Archibuteo ferrugineus*. One in the collection of E. W. Darbey was shot, in 1895, at Niverville, fifteen miles south-west of Winnipeg, by Geo. Grieve. There is another specimen in the Manitoba Museum.

109. **Golden Eagle.** *Aquila chrysaetos*. Rare, but apparently resident.
110. **Bald Eagle.** *Haliaeetus leucocephalus*. Summer visitant, of general distribution wherever there are fish.
111. **Gray Gyrfalcon.** *Falco rusticolus*. A rare winter visitant. A specimen was killed near Winnipeg in the fall of 1904, and mounted by E. W. Darbey for the Manitoba Museum. Two fine specimens taken by W. R. Hine were at one time in the same collection.
112. **Duck Hawk.** *Falco peregrinus anatum*. Much like the Goshawk in movements and distribution. Probably breeds in the neighborhood of the large lakes. Quite common on the Big Plain about August.
113. **Pigeon Hawk.** *Falco columbarius*. Common spring and fall migrant, breeding in the woods of northern Manitoba.
- 113a. **Richardson Merlin.** *Falco columbarius richardsoni*. A Plains race, said to be a regular summer resident along Souris River. A fine specimen was killed in Winnipeg during the summer of 1900 and brought in the flesh to A. Calder, in whose collection it may now be seen.
114. **American Sparrow-hawk.** *Falco sparverius*. Abundant summer resident; of general distribution wherever there is woods.
115. **American Osprey.** *Pandion haliaetus carolinensis*. A summer resident about all the fish-stocked rivers and lakes. Reported from all parts of the Province, but rare.
116. **American Long-eared Owl.** *Asio wilsonianus*. Sum-

mer resident in all wooded sections. Arrives April 15; departs October 20.

117. **Short-eared Owl, Marsh-owl.** *Asio flammeus*. Common summer resident in all marshy and prairie sections. Arrives April 1; departs October 30.
118. **Barred Owl.** *Strix varia*. Summer resident of the wooded sections. The records show it to be more widely diffused than was once believed. In 1886 I saw a specimen taken at Kenora. In my collection is one taken at Winnipeg, March 30, 1906, by Harry Jones. E. W. Darbey writes me that he had four, taken at Winnipeg in 1906, and one early in April, 1908. At Portage la Prairie I was shown a female taken by G. E. Atkinson, May 19, 1899. J. S. Charleson writes me that on May 9, 1901, while canoeing up the Assiniboine near Winnipeg, he saw a Barred Owl in a tree. Also he secured a specimen from Riding Mountain in January, 1905; it was killed by T. S. Kittson, and had in its stomach a flying squirrel. Arrives about April 1; departs about November 1.
119. **Great Gray Owl.** *Scotiaptex nebulosa*. One specimen, taken on the Big Plain, September 29, 1884. Rather common along the Red River, and resident in the woods about Lake Winnipeg.
120. **Richardson Owl.** *Glaux junerea richardsoni*. A common winter visitant in the Alleghanian region, but probably resident and breeding in the Canadian part of the Province.
121. **Saw-whet Owl.** *Glaux acadica*. Rare, but apparently a permanent resident.
122. **Western Horned Owl.** *Bubo virginianus pallescens*. Common resident wherever there is woods.
- 122a. **White Horned Owl.** *Bubo virginianus subarcticus*.

Rare in Manitoba; in A. Calder's collection are two superb specimens of this northern form. They were taken recently at Winnipeg. It is recorded also from MacDonald, Duck Mountain, and Touchwood Hills.

123. **Snowy Owl, White Owl.** *Nyctea nyctea*. Common winter visitant, sometimes appearing in large numbers. Arrives October 1; departs April 15.
124. **American Hawk-owl.** *Surnia ulula caparoch*. Very abundant some years. Arrives late in September, and remains until April. May yet be found breeding in the extreme north of the Province.
125. **Burrowing Owl.** *Speotyto cunicularia hypogaea*. There is one of the species that have appeared in Manitoba recently. In the early eighties it was quite unknown.

In August, 1899, at the taxidermist shop of G. E. Atkinson, Portage la Prairie, I saw two Burrowing Owls that were taken by a farmer about four miles north-west of the town, on June 2, 1897. Two others were brought to the shop in May, 1899. The specimen in my collection (No. 2,594) is one of two taken at Morden by D. Nicholson, the taxidermist. He reports it rare, but regular and increasing. Two others were taken in 1902. E. W. Darbey tells me that it is becoming quite common along the Pipestone and on the slope of Riding Mountain.

In 1904 J. P. Turner found a nest eight miles north-west of Winnipeg. The species utilizes the burrows of the Richardson ground-squirrel for a nesting place.

126. **Black-billed Cuckoo.** *Coccyzus erythrophthalmus*. A common summer resident in all the Alleghanian region; not yet recorded beyond that limit. Arrives late in May, departing at the end of August.

127. **Belted Kingfisher.** *Ceryle alcyon*. Common summer resident everywhere along streams and fish frequented lakes. Arrives April 20; departs in October.
128. **Northern Hairy Woodpecker.** *Dryobates villosus leucomelas*. Common resident of woods everywhere.
129. **Downy Woodpecker.** *Dryobates pubescens medianus*. Common resident throughout the Province, excepting possibly the north-eastern corner.
130. **Arctic Three-toed Woodpecker.** *Picoides arcticus*. Common resident in the forested region. Most plentiful in winter, therefore probably in some degree migratory.
131. **American Three-toed Woodpecker.** *Picoides americanus*. Rare permanent resident of the Canadian region. Unfortunately no specimens are available. Both W. R. Hine and R. H. Hunter claim to have seen it in the woods east of Winnipeg, and at Kenora, in 1886, I saw a supposed specimen, beside which its known range includes the forested portion of the Province.
132. **Yellow-bellied Sapsucker.** *Sphyrapicus varius*. Common summer resident of all the Alleghanian region; not yet recorded from the Canadian. Arrives about May 1.
133. **Pileated Woodpecker, Cock-of-the-Woods.** *Phloeotomus pileatus abieticola*. Rare resident in heavy timber and spruce woods throughout the Province.
134. **Red-headed Woodpecker.** *Melanerpes erythrocephalus*. A rare summer resident of south-western Manitoba, apparently confined to regions where oaks are found.
135. **Flicker, Highholder.** *Colaptes auratus luteus*. Very

abundant summer resident throughout the Province wherever there are trees. Arrives April 15; departs September 30.

136. **Red-shafted Flicker.** *Colaptes cafer collaris*. A full plumaged female in my collection (No. 2,546) was shot near Winnipeg, Sept. 30, 1904, by T. Dolphin. At Portage la Prairie, in August, 1899, I saw in G. E. Atkinson's taxidermist shop a fine adult hybrid Flicker, shot in the vicinity, April 16, 1897.
137. **Whip-poor-will.** *Antrostomus vociferus*. Abundant summer resident in woods and partly wooded regions throughout the Province.
138. **Night-hawk.** *Chordeiles virginiana*. The Night-hawk is common throughout Manitoba, and thus the typical form seems to be the one in all but the true prairie region.
- 138a. **Western Night-hawk.** *Chordeiles virginianus henryi*. Very abundant summer resident of the prairies in south-western Manitoba. Arrives May 24; departs August 30.
139. **Chimney Swift.** *Chaetura pelagica*. Summer resident of the Alleghanian region, nowhere very common, and most numerous about the towns. Arrives about May 15; departs early in September.
140. **Ruby-throated Hummingbird.** *Trochilus colubris*. This is a summer resident in the Alleghanian region, wherever it finds suitable surroundings—that is, a warm sheltered garden with red flowers. Arriving about May 23.
141. **Scissor-tailed Flycatcher.** *Muscivora forficata*. Accidental straggler. One found by C. W. Nash, at Portage la Prairie, October 31, 1884. (See Auk, April, 1885, p. 218.)
142. **Kingbird.** *Tyrannus tyrannus*. Very abundant

summer resident throughout the Province wherever there are trees or even small bushes. Arrives May 20; departs August 30.

143. **Arkansas Kingbird.** *Tyrannus verticalis*. Two specimens of this, an adult and one in first plumage, were taken by D. Losh Thorpe at the Souris coal fields, August 20, 1891. This is not many miles to the west of the Province, and justifies the insertion [of the species as *probably* Manitoban.
144. **Crested Flycatcher.** *Myiarchus crinitus*. Summer resident about Winnipeg; noted several times at Carberry. Taken by Professor Macoun at Lake Manitoba, June 17, 1881. Quite common along the Assiniboine. On Aug. 20, 1904, I got one at Lake Winnipegosis. This is the northernmost that I know of.
145. **Phoebe.** *Sayornis phoebe*. Rare summer resident, but apparently found in all parts of the Province; recorded even from Norway House.
146. **Olive-sided Flycatcher.** *Nuttallornis borealis*. A common summer resident in all the wooded parts of the Province.
147. **Wood Pewee.** *Myiochanes virens*. Summer resident of the heavy woods in the Alleghanian region.
148. **Western Wood Pewee.** *Myiochanes richardsoni*. Common summer resident of the willow thicket and open groves throughout the Alleghanian region.
149. **Yellow-bellied Flycatcher.** *Empidonax flaviventris*. Summer resident, frequenting woodlands. Noted at Winnipeg, Portage la Prairie, Duck Mountain, and Oak Lake. Probably throughout the Alleghanian region.
150. **Alder Flycatcher.** *Empidonax trailli alnorum*. Recorded from Pembina, Carberry, Lake Manitoba,

Duck Mountain, Riding Mountain, and Norway House, so doubtless it is generally distributed throughout the Province wherever there is cover. An abundant summer resident.

151. **Least Flycatcher.** *Empidonax minimus*. Very abundant summer in all wooded localities. Arrives May 20; departs late in September.
152. **Prairie Horned Lark.** *Otocoris alpestris praticola*. Abundant, breeding in all the prairie regions. Resident, excepting during December, January, and February. Breeds twice each season.
- 152a. **Shore Lark.** *Otocoris alpestris*. Fall migrant. Taken at Carberry and Kenora.
153. **American Magpie.** *Pica hudsonia*. Irregular, rare resident. Found west of Fort Ellice, and occasionally along the Upper Assiniboine. A single specimen reported from Brandon.
154. **Blue Jay.** *Cyanocitta cristata*. Common summer resident of woodlands throughout the Province. Arrives early in April; departs late in November. May be resident in southern localities.
155. **Canada Jay, Whiskey-jack.** *Wis-ka-tjan*, *Perisoreus canadensis*. Abundant resident throughout the wooded region. The common name of this bird is a corruption of the Indian Wis-ka-tjan. This last name should not be lost sight of.
156. **American Raven.** *Corvus corax principalis*. Winter visitant in all the Alleghanian region. Said to be resident, and of course breeding, in the Canadian regions to the north; not common anywhere.
157. **American Crow.** *Corvus brachyrhynchos*. Summer resident throughout the Province. Abundant in the Alleghanian region; scarce in the Canadian.

158. **Bobolink.** *Dolichonyx oryzivorus*. Abundant summer resident in all the prairie region. Arrives May 20, departs September 7.
159. **Cowbird.** *Molothrus ater*. Very abundant summer resident throughout the prairie region. Arrives May 15; departs late in the fall, but disappears for a time during the moult at the end of August. They are then to be found, I believe, in the sloughs and marshes with the Grackles.
160. **Yellow-headed Blackbird.** *Xanthocephalus xanthocephalus*. A summer resident of the marshes throughout the Alleghanian region; found also, but much less numerously, in the Canadian region; wherever there are extensive marshes. Arrives May 1, departs late in October.
161. **Northern Redwing.** *Agelaius phoeniceus arctolegus*. Abundant summer resident of the whole Province. Arrives April 20; departs late in October.
162. **Western Meadow Lark.** *Sturnella neglecta*. Abundant summer resident of all the prairie regions. Arrives April 15; departs October 15.
163. **Orchard Oriole.** *Icterus spurius*. One specimen, taken at Pembina, June 6, 1873, by Dr. Coues.
164. **Baltimore Oriole.** *Icterus galbula*. Abundant summer resident of the Alleghanian region. Arrives May 30; departs August 30.
165. **Rusty Blackbird.** *Euphagus carolinus*. Extremely abundant migrant during April and late September. Not found in the Alleghanian region during summer, but probably breeding in the north-west parts of the Province within the Canadian.
166. **Brewer Blackbird, Satin Bird.** *Euphagus cyanocephalus*. Abundant summer resident, apparently

confined to the Alleghanian region. Arrives April 15; departs November 1.

167. **Bronzed Grackle.** *Quiscalus quiscula aeneus*. Abundant summer resident wherever there is woodland. Arrives April 20; departs October 15.
168. **Evening Grosbeak.** *Hesperiphona vespertina*. Common winter visitant in the vicinities of Winnipeg, Portage la Prairie, and Qu'Appelle, Big Island in Lake Winnipeg, and Selkirk. (R. H. Hunter.)
169. **Pine Grosbeak.** *Pinicola enucleator leucura*. Common winter visitant in all the wooded sections, probably breeding in the northmost parts of the Province.
170. **Purple Finch.** *Carpodacus purpureus*. Common summer resident of all wooded regions. Arrives early in May; departs middle of September.
171. **English Sparrow.** *Passer domesticus*. This species is now found in all the settled portions of Manitoba, and at every farmhouse and in all the towns of the North-west as far as Athabaska Landing, Alberta, about N. Latitude 55, W. Longitude 113. It first appeared at Carberry in 1892, but was not found in numbers until 1894. According to Criddle, it is developing a habit of migration.
172. **American Crossbill.** *Loxia curvirostra minor*. Common as a winter visitant at Winnipeg, Portage la Prairie and Big Plain, possibly breeding, as it is known to do so in Minnesota (Trippe).
173. **White-winged Crossbill.** *Loxia leucoptera*. Common winter visitant about Winnipeg and Big Plain; may breed in the Canadian region.
174. **Gray-crowned Finch, Pink Snowbird.** *Leucosticte tephrocotis*. I have in my collection an adult of species taken near Birtle, Manitoba, in January,

1891, by George Copeland. Also in the Manitoba Museum are two specimens taken in the Province by W. R. Hine. These give a considerable eastward extension to the range of the species.

175. **Hoary Redpoll.** *Acanthis hornemanni exilipes*. Noted only as a rare migrant; in fall and winter accompanies *A. linaria*.
176. **Redpoll.** *Acanthis linaria*. Abundant fall and winter visitant, arriving from the north about October 20, and departing about May 1.
177. **American Goldfinch.** *Astragalinus tristis*. Common summer resident of the Alleghanian region. Arrives last week of May; departs middle of September.
178. **Pine Siskin.** *Spinus pinus*. An irregular and abundant spring and fall visitant; may breed in the Canadian region.
179. **Snowflake, Snow-bunting.** *Plectrophenax nivalis*. Very abundant spring, fall, and winter resident, arriving about the middle of October and staying until the end of April.
180. **Lapland Longspur.** *Calcarius lapponicus*. Very abundant spring and fall migrant. Arrives May 15, and again September 20.
181. **Painted Longspur.** *Calcarius pictus*. Abundant spring and much less plentiful fall migrant. Arrives on May 10, stays two weeks, and again on September 15 for a few days.
182. **Black-breasted Longspur.** *Calcarius ornatus*. Common summer resident of the dry prairies. Local in distribution, many pairs sometimes affecting a limited area of dry prairie, while again for miles no more of the species are to be seen. Arrives May 16; departs August 30.
183. **McCown Longspur.** *Rhynchophanes mecowni*. A

- specimen of this bird, taken by D. Losh Thorpe, near Dalesbro, just west of our borders, justifies its inclusion as a probable straggler.
184. **Western Vesper-sparrow.** *Pooecetes gramineus confinis*. Very abundant summer resident of the prairie region. Arrives May 1; departs September 30.
185. **Savanna Sparrow.** *Passerculus sandwichensis savanna*. Doubtless found as a summer resident in open places throughout our Canadian area, as Preble found it general in Keewatin and at Norway House.
- 185a. **Western Savanna-sparrow.** *Passerculus sandwichensis alaudinus*. Abundant summer resident of the prairie region. Arrives May 1; departs September 30.
186. **Baird Sparrow.** *Coturniculus bairdi*. Abundant summer resident throughout the prairie region wherever there are alkaline flats. Taken at Grand Rapids (*Nutting*).
187. **Leconte Sparrow.** *Ammodramus lecontei*. Abundant summer resident of willow bottom-lands throughout the prairie region. Arrives May 1; departs September 30.
189. **Nelson Sparrow.** *Ammodramus nelsoni*. In 1892 I found this sparrow abundant at Carberry and secured specimens, both breeding and migrant. In 1901 I found it common at Shoal Lake. In my collection are three specimens taken at Winnipeg. There can be little doubt that it is found throughout south-western Manitoba, and breeds wherever found.
189. **Lark Sparrow.** *Chondestes grammacus*. Rare summer resident. Noted only in the vicinity of Winnipeg and at Portage la Prairie.

190. **Black-faced or Harris Sparrow.** *Zonotrichia querula*. Abundant spring and fall migrant. Arrives May 15 and again September 20, remaining a week or ten days each time. Breeds in Hudsonian fauna. Nest found in far north. See Auk, Jan. 1998, p. 72.
191. **White-crowned Sparrow.** *Zonotrichia leucophrys*. Migrant, not common. Passes through in early May and late September. Probably breeds in the extreme north-eastern part of the Province.
- 191a. **Gambel Sparrow.** *Zonotrichia leucophrys gambeli*. A migrant only, abundant on the Souris in fall migration (*Coues*). I have seen specimens taken at Carberry and at Portage la Prairie.
192. **White-throated Sparrow.** *Zonotrichia albicollis*. Common summer resident of all the wooded country. Arrives early in May; departs late in October.
193. **Tree-sparrow.** *Spizella monticola*. Abundant migrant in all parts of the Province from mid-April to mid-May, and again through October.
194. **Chipping Sparrow.** *Spizella passerina*. Summer resident about small towns and along wooded edges, apparently throughout the Province, as it is recorded from Pembina, Winnipeg, Norway House, Oxford House, Grand Rapids, Prince Albert, and Qu'Appelle, as well as Carberry and Portage la Prairie. Not common; mid-April to late September.
195. **Clay-colored Sparrow.** *Spizella pallida*. Very abundant summer resident of the Alleghanian region. Arrives May 15; departs October 1.
196. **Slate-colored Junco.** *Junco hyemalis*. Abundant migrant throughout the Province, and doubtless breeding in all the Canadian region, though there are few records of it. Arrives the first week of April, and departs in October.

197. **Montana Junco.** *Junco hyemalis montanus*. Among the migrant flocks of the preceding I have several times seen this race near Carberry; one or two were collected.
198. **Song Sparrow.** *Melospiza melodia*. Summer resident throughout the Province. Not common. Arrives late in April; departs early in October.
199. **Lincoln Sparrow.** *Melospiza lincolni*. Spring and fall migrant. Noted during first week of May and last week of September. Probably breeding in the extreme north-eastern part of the Province.
200. **Swamp Sparrow.** *Melospiza georgiana*. Common summer resident throughout the Province, but most abundant in the Alleghanian region.
201. **Fox Sparrow.** *Passerella iliaca*. Common migrant in the prairie region, arriving in mid-April. Breeding abundantly on Duck Mountain and apparently in all the Canadian region of the Province.
202. **Towhee.** *Pipilo erythrophthalmus*. Common summer resident of the Alleghanian region north at least to Carberry; not yet recorded beyond.
203. **Arctic Towhee.** *Pipilo maculatus arcticus*. This Western species appears in this list on the strength of a specimen taken on the Souris at the boundary, September 16, 1873, by Dr. Elliot Coues.
204. **Rose-breasted Grosbeak.** *Zamelodia ludoviciana*. Common summer resident of the Alleghanian region, possibly farther, as there is one record for the north end of Lake Winnipeg.
205. **Indigo Bunting.** *Passerina cyanea*. A male adult Indigo Bunting (No. 2,531 Seton Coll.) was killed on June 3, 1893, by W. R. Hine, near St. Boniface, between the Seine and Assiniboine Rivers, on the

land between the Bishops's Marsh and the River Seine. Another adult male was taken at Estevan, South Saskatchewan, by D. L. Thorpe, 29 May, 1892. Estevan is eighty miles west of Manitoba. In the collection of Father Blain, St. Boniface College, is an extraordinary specimen killed at Winnipeg. After careful examination E. A. Preble and I agree that it is probably a hybrid Indigo Bunting X Common Canary, maybe escaped from captivity. With the general form and color of an Indigo Bunting female, it has some patches of yellow, and a white tail and wings.

206. **Dickcissel or Black-throated Bunting.** *Spiza americana*. August 10, 1899, I was shown an adult specimen of this bird by G. E. Atkinson, who shot it at Portage la Prairie, June 1, 1897. This was recorded in "Man. Free Press," March 5, 1904.

207. **Scarlet Tanager.** *Piranga erythromelas*. I have seen two specimens that were taken at Winnipeg in 1892, one in the collection of George Grieve, the other in the collection of W. R. Hine. He also took another, and saw a third in 1888. It was about the end of May, during a sudden cold spell. The third he saw on the bank of Red River in the city limits; he was within two yards of it for some time, but did not collect it.

R. H. Hunter writes me that in June, 1880, while camping east of Winnipeg, he observed a pair, evidently nesting, and adds that his companion, Clementi-Smith, has "seen several pairs on the shores of Lake Winnipeg." "Lake Winnipeg" (Ridgway). "Rare at Qu'Appelle" (Guernsey).

208. **Purple Martin.** *Progne subis*. Common summer resident of all the Alleghanian region wherever there is large timber to furnish nesting sites; also in towns.

209. **Cliff Swallow.** *Petrochelidon lunifrons*. Abundant summer resident in all parts of the Province where cliffs or tall buildings in quiet places furnish nesting sites. Arrives May 15; departs August 30.
210. **Barn Swallow.** *Hirundo erythrogastra*. A summer resident of erratic distribution. Seldom seen about Winnipeg, not recorded from Portage la Prairie, and yet in 1904 J. S. Charleson the taxidermist told me it was common at MacDonald and at Brandon. There is quite a colony at the former place under the long bridge. At Carberry I saw one or two each year; they arrived in the first half of May. Thus there are many records to show that, though rare, it is of general distribution, and further, it is increasing with the advance of settlement. Near Wawanesa, on September 13, 1904, I saw a long straggling flock of nearly a hundred of the species flying south-west; many were within three or four feet of me as I drove.
211. **Tree Swallow.** *Tridoprocne bicolor*. Abundant summer resident in all parts of the Province where there are large trees.
212. **Bank Swallow, Sand Martin.** *Riparia riparia*. Common summer resident wherever it can find suitable banks for nesting. Arrives mid-May; departs late in August.
213. **Saw-winged Swallow.** *Stelgidopteryx serripennis*. In the Manitoba Museum is a specimen of this Swallow, taken at Winnipeg by W. R. Hine.
214. **Bohemian Wax-wing.** *Bombycilla garrula*. A common winter visitant in most parts of Manitoba; often seen in November and April. Not known to nest here.
215. **Cedar Wax-wing, Cherry Bird.** *Bombycilla cedro-*

- rum*. Abundant summer resident throughout the Province. Arrives late in May.
216. **Northern Shrike.** *Lanius borealis*. Common spring and fall visitant, passing through toward the north in the first half of April, returning during October.
217. **White-rumped Shrike.** *Lanius ludovicianus excubitorides*. Abundant summer resident throughout the Alleghanian regions. Arrives early in May; departs late in September.
218. **Red-eyed Vireo.** *Vireosylva olivacea*. Abundant summer resident wherever there is cover in all parts of the Province. Arrives May 24; departs late in August.
219. **Philadelphia Vireo.** *Vireosylva philadelphia*. A regular summer resident, not abundant, but probably in the woodlands throughout the Province. I found the nest and eggs near Fort Pelly (north-west of Duck Mountain), June 9, 1884. (See Auk, July, 1885, pp. 305, 306.)
220. **Warbling Vireo.** *Vireosylva gilva*. Common summer resident of the Alleghanian region. Arrives May 30.
221. **Yellow-throated Vireo.** *Lanivireo flavifrons*. This species has not yet been taken in Manitoba, so far as I know, but being an Eastern species taken at Yorktown, Sask., by W. Raine, and at Moosejaw by Miller Christy, it is included as probable. W. R. Hine claims to have seen it on the Red River.
222. **Blue-headed Vireo.** *Lanivireo solitarius*. Summer resident in all parts of Manitoba; not common. Arrives about May 15.
223. **Black and White Warbler.** *Mniotilta varia*. Summer resident in all the wooded parts of the Province;

apparently most numerous in the spruce forests of the Canadian region. Arrives about May 15; departs at the end of August.

224. **Nashville Warbler.** *Helminthophila rubricapilla*. Rare summer resident. Noted at Aweme, Lake Manitoba, Duck Mountain, and along Red River.
225. **Orange-crowned Warbler.** *Helminthophila celata*. Common summer resident of all woodlands, apparently throughout the Province. Arrives May 12; departs end of September.
226. **Tennessee Warbler.** *Helminthophila peregrina*. Summer resident, breeding in most woodlands, but not plentiful. Noted on Big Plain and Duck Mountain, and along Red River near Winnipeg. At Pembina common in the spring migration (*Coues*). North shore of Lake Winnipeg (*Kennicott*). Aweme (*Criddle*). Arrives in mid-May; departs at the end of September.
227. **Cape May Warbler.** *Dendroica tigrina*. Abundant migrant along Red River and a common summer resident in some regions, but erratic in distribution. Recorded from Winnipeg, Shoal Lake, and Moose Factory. Migrates in mid-May and late August.
228. **Yellow Warbler.** *Dendroica aestiva*. Very abundant summer resident of all thickets and woods throughout the Province. Arrives May 15; departs September 7.
229. **Myrtle Warbler.** *Dendroica coronata*. Abundant migrant throughout the Province, breeding in the Canadian region. Arrives April 23; departs September 12.
230. **Magnolia Warbler.** *Dendroica magnolia*. Noted only as a migrant, but doubtless breeds in the Canadian region. Arrives mid-May; departs early September.

231. **Chestnut-sided Warbler.** *Dendroica pennsylvanica*. Common summer resident in woodlands of the Alleghanian region. Arrives about May 20.
232. **Bay-breasted Warbler.** *Dendroica castanea*. A regular migrant, especially along Red River; not common. Probably breeds in the northernmost part of the Province. Arrives mid-May.
233. **Black-poll Warbler.** *Dendroica striata*. Noted only as a migrant; not plentiful. Arrives at Aweme about May 13.
234. **Black-throated Green Warbler.** *Dendroica virens*. Norman Criddle reports this at Aweme on May 13 and 17, 1898.
235. **Blackburnian Warbler.** *Dendroica blackburniae*. A rare migrant in the Alleghanian region, probably breeding in the Canadian. Arrives late May.
236. **Pine Warbler.** *Dendroica vigorsi*. A rare summer resident in the evergreen forests of South-eastern Manitoba. "Arrives about May 10; departs about September 2" (Criddle).
237. **Palm Warbler.** *Dendroica palmarum*. A common spring and fall migrant in the Alleghanian region; may breed in the Canadian. Passes about the first week of May, and again about September 15.
238. **Ovenbird.** *Seiurus aurocapillus*. Common summer resident of woodlands; apparently found throughout the Province. Arrives in mid-May; departs in mid-September.
239. **Water-thrush.** *Seiurus noveboracensis notabilis*. Common summer resident of all woodlands where there is water. Arrives in mid-May; departs late in September.
240. **Connecticut Warbler.** *Oporornis agilis*. Somewhat common summer resident from mid-May to early

September. Noted on Duck Mountain, Big Plain, and along Red River. Nest found June 21, 1883. (See Auk, April, 1884, pp. 192, 193.)

241. **Mourning Warbler.** *Oporornis philadelphia*. Common summer resident of dry scrub lands throughout the Alleghanian region, arriving in late May, "departing early in September" (Criddle).
242. **Northern Yellowthroat.** *Geothlypis trichas*. Common summer resident of thickets in the Alleghanian region, arriving about May 20, departing in September.
343. **Wilson Warbler.** *Wilsonia pusilla*. Summer resident throughout the Province; not common. Arriving in mid-May, departing in mid-September.
244. **Canadian Warbler.** *Wilsonia canadensis*. Apparently found throughout the Province as a rare summer resident. According to N. Criddle it arrives about May 20 and departs the last of August.
245. **American Redstart.** *Setophaga ruticilla*. Common summer resident of all woodlands. Arrives in mid-May; departs in mid-September.
246. **American Pipit.** *Anthus rubecens*. Abundant spring and fall migrant throughout the Province.
247. **Sprague Pipit., Missouri Skylark** *Anthus spraguei*. Formerly resident summer of Assiniboine region wherever there were high dry prairies, arriving May 1, departing September 1. This bird was very abundant on the Big Plain in 1882, but in 1892 I failed to see or hear a single individual in the country. It appears to have totally disappeared. This is unquestionably owing to the breaking up of the virgin prairie.
248. **Catbird.** *Dumetella carolinensis*. Abundant sum-

- mer resident of the Alleghanian region. Arrives in mid-May; departs mid-September.
249. **Brown Thrasher.** *Toxostoma rufum*. Common summer resident of the Alleghanian region wherever there are open woodlands. Arrives May 15; departs September 7.
250. **Western House Wren.** *Troglodytes aedon parkmani*. Abundant summer resident, apparently confined to the Alleghanian region. Arrives May 20; departs about the end of September.
251. **Winter Wren.** *Nannus hiemalis*. This is a woodland species, apparently common in the southeastern quarter of the Province only. R. H. Hunter found it a common summer resident in the woods east of Winnipeg. C. W. Nash saw one at Winnipeg, and another at Portage la Prairie. N. Criddle found it at Aweme.
252. **Short-billed Marsh-wren.** *Cistothorus stellaris*. Summer resident of the Alleghanian region; erratic in distribution. Preble found it at Norway House. Arrives May 15; departs Sept. 15.
253. **Long-billed Marsh-wren.** *Telmatodytes palustris iliacus*. Summer resident; of extensive, though erratic, distribution. Common at Winnipeg, Shoal Lake, and Portage la Prairie. Recorded at Oak Point, Aweme, Waterhen River, and on Saskatchewan. Arrives early in May.
254. **Brown Creeper.** *Certhia familiaris americana*. A rare summer resident. Noted at Winnipeg and Portage la Prairie, and Riding Mountain.
255. **Slender-billed Nuthatch.** *Sitta carolinensis aculeata*. Somewhat rare resident of the heavily timbered regions. Absent from the Province only during the hardest part of the winter.

256. **Red-breasted Nuthatch.** *Sitta canadensis*. Rare summer resident of the woods in all parts of the Province; abundant during the migration in September.
257. **Long-tailed Chickadee.** *Penthestes atricapillus septentrionalis*. Resident; abundant in all the woodlands. The Manitoba bird is not strictly *septentrionalis*, but is nearer to that form than to *atricapillus*.
258. **Hudsonian Chickadee.** *Penthestes hudsonicus*. The only record is as follows:—"In flocks around the Porcupine Mountains" (*Macoun*). The bird is certainly not found in the Assiniboine region, and there are no Red River records, though it should be the prevailing species in the Winnipeg Basin.
259. **Golden-crowned Kinglet.** *Regulus satrapa*. Rare migrant. Noted at Carberry, November 5, 1884, and recorded also from Aweme, Portage la Prairie, and Winnipeg.
260. **Ruby-crowned Kinglet.** *Regulus calendula*. Common migrant. Noted on Big Plain about May 15, along Red River, and at Portage la Prairie. "On Souris in September" (*Coues*). Probably breeds in the north-east part of the Province. Passes through in late April and early May; again about the 1st of October.
261. **Willow Veery.** *Hylocichla fuscescens salicicola*. Abundant summer resident of all thickets in the Alleghanian region. Arrives in mid-May; departs early in September.
262. **Gray-cheeked Thrush.** *Hylocichla aliciae*. Common migrant. Imperfectly observed, as it is not usually distinguished from the next.
263. **Olive-backed Thrush.** *Hylocichla ustulata swainsoni*. Common summer resident of woodlands

apparently throughout the Province. Arrives May 1; departs early in October.

264. **Hermit Thrush.** *Hylocichla guttata pallasi*. Common summer resident of woodlands in the Canadian region. A migrant in the Alleghanian, passing in late April and early October.
265. **American Robin.** *Planesticus migratorius*. Abundant summer resident throughout the Province. Arrives April 15; departs October 15.
266. **Bluebird.** *Sialia sialis*. Formerly very rare; has become quite a regular summer resident in the country along the Assiniboine, and nearly every grove of oak of any extent is found to have a pair making their home in it along with the Purple Martins.
268. **Mountain Bluebird.** *Sialia currucoides*. E. H. Patterson secured one of a pair that he found at a place two miles west of Brandon, and sent the same to G. E. Atkinson, who recorded it in "Man. Free Press," March 5, 1904. To this, Norman Criddle (the naturalist responsible for records from Aweme) adds ("Ottawa Naturalist," July, 1904, pp. 85, 86) that the species is by no means uncommon about the Carberry sandhills, and that he has taken numerous nests there.

THE FISH AND FISHERIES OF MANITOBA

By PROFESSOR EDWARD E. PRINCE,

Dominion Commissioner of Fisheries and Canadian Representative on the
International Fisheries Commission.

IT has been justifiably claimed for the fishing industries of Manitoba that they are the greatest fresh-water fisheries in the world. The earliest fishery was carried on by the native Indian tribes for food for themselves and their dogs, but the officers of the Hudson's Bay Company, at their numerous posts in this region, depended upon fish very largely, and since 1811, when the first white settlers were brought to the banks of the Red River by Lord Selkirk, a regular fishery has been pursued, which has grown to enormous dimensions, especially during the last thirty years. The species of principal importance are the lake whitefish (*Coregonus clupeiformis*), the pike-perch or yellow pickerel (*Stizostedion vitreum*), the sturgeon (*Acipenser*), and the pike or jackfish (*Lucius*). The whitefish of Manitoba, especially of Lake Winnipeg, have an envied reputation in the markets of this continent; and the caviare and flesh of the sturgeon from these waters have always ranked very high.

The relative economic importance of the following species may be judged from the figures given below.

	1887		1897		1907	
	Weight	Value	Weight	Value	Weight	Value
Whitefish .	2,300,000 lbs.	\$106,000	3,363,900 lbs.	\$168,193	3,695,000 lbs.	\$258,650
Pike-perch.	144,500 "	5,800	1,343,000 "	53,721	3,995,000 "	239,700
Pike. . . .	311,000 "	8,200	639,973 "	6,399	2,321,000 "	81,235
Tullibee . .	18,736 "	650	359,410 "	3,594	1,380,000 "	48,300

During the last twenty years the annual value of the fisheries of the Province has risen rapidly, partly owing to the exploitation of new waters, and partly owing to the higher market value of food-fishes in recent years. Thus, in 1887, the total value was \$129,084, in 1897 \$261,126, and in 1907 it was \$806,615. While a proportion of the catch is sent to local and to Eastern Canadian markets, the greater part (fully 75%) is sent to the United States markets, certain large foreign "fish combines" having undoubted control over the handling of these supplies of Canadian fish. The last official returns (1907) credit the Province with a total catch of 16,538,500 lbs. of fish of all kinds for that year.

The total area of the waters fished is not less than 20,000 square miles, the three largest lakes, Lake Winnipeg (9,460 sq. miles), Lake Winnipegosis (2,068 sq. miles), and Lake Manitoba (1,775 sq. miles) exceeding the Netherlands in extent, but other lakes, St. Martin, Dauphin, Shoal, Swan and Waterhen, contribute their quota, these lakes ranging from 100 to 200 square miles, while Moose (552 sq. miles), Cedar (285 sq. miles), Playgreen (223 sq. miles) and other more distant lakes, though beyond the Provincial boundary, must be included in the Manitoba fisheries, all the catches being sent down to the main shipping points in the Province. It is interesting to note that the Manitoba lakes are exclusively in Canadian territory, and are not shared, as are the Great Lakes to the east, with the Republic to the south. Hence, while Lake Superior is more than three times the area of Lake Winnipeg, Huron twice, and Erie almost of the same area, yet the superficial extent of the Canadian portion of these eastern waters does not greatly exceed the total area of the Manitoba fishing grounds.

To develop the fishing industry on an adequate

scale, in waters so vast, large capital was essential. Fishing companies were accordingly organized, with fleets of steam tugs, immense outfits of nets, ice houses and stores, refrigerators and other necessary equipment. Fishing on a limited scale had always been engaged in by the settlers and Indians, and the numerous Icelandic colonies in more recent years have assiduously continued this practice. Much of this fishing is carried on through holes in the ice in winter. But even so recently as 1899 the Winnipeg Board of Trade stated that the fishing industries of the Province were only "in their infancy," and undoubtedly, with proper safeguards against depletion, these industries, which have increased, like the population of the Province, more than sixfold during the last twenty years, are still capable of further development. The productiveness of the waters of the Province is proved by the fact that from 1890 to 1907 84,000,000 lbs. of whitefish were shipped from Manitoba and 5,329,000 lbs. of sturgeon, including a large quantity of caviare, much of it exported to Germany to be sold as the best Russian product. Like all fisheries, those of this Province have been subject to fluctuations; some branches, such as the sturgeon fishery, have alarmingly declined, while others, like the pike-perch or pickerel fishery, have greatly expanded. The whitefish supply, in the opinion of many, has decreased, and the large annual catch, in 1906 exceeding 5,000,000 lbs., was, it is held, due only to more persistent fishing and the use of excessive amounts of gear. All fishing operations are carried on under license from the Dominion Government, and under the supervision of a staff of Federal fishery officers, who have authority to enforce the laws and regulations under the Dominion Fishery Act.

The parties who carry on fishing consist of (1) large fishing companies in which United States firms have very considerable interest, they operate in the northern

parts of Lake Winnipeg and the more distant lakes, chiefly in summer and in extensive areas where fishermen without capital, tugs, fish-houses and refrigerators could not take or handle the fish. (2) Settlers, largely Scandinavians, with a proportion of Austrians and Germans, who fish in summer in small boats, and, on a vastly more extensive scale, through the ice in winter, mainly in the shallower southern parts of Lake Winnipeg and in the smaller lakes. (3) Indians and half-breeds, who fish from their reserves for food but also for sale, and have specially carried on a sturgeon fishery. In the rivers, such as the Red River, settlers and others use seines and other apparatus for catching pickerel or pike-perch, catfish, gold-eyes (an excellent fresh-water herring), perch, and coarse fish.

It is estimated that at least 5,000 persons are more or less engaged in the fisheries, but the number of regular fishermen is now about 2,000, as compared with 850 twenty years ago. In 1887, it may be noted, there were 7 steam tugs, 550 tons total, valued at \$26,500; and 65 fishing boats, 118 tons, valued at \$6,785; whereas there are now 22 tugs of 1,034 tons total tonnage, valued at \$132,000 and employing about 150 men, and in addition 530 boats, valued at \$24,000, with crews totalling up to 1,800 men. Fishing by means of baited lines, fyke or hoop nets, etc., is extensively pursued, and the takes are principally coarse fish, the present annual catch of which amounts to no less than 5,000,000 lbs. The cleaning of the fish, icing, and other processes are carried out at various points on the lakes, such as Spider Island, Black River, Eagle Island, Poplar River, Beren's River, Snake Island, Bull Head, Horse Island, and Warren's Landing, these resembling busy villages, with wharves and crowded dwellings. Warren's Landing is about 400 miles from Winnipeg city. About ten years ago fresh fish, in broken ice, were first brought from Selkirk Island (at the

north end of Lake Winnipeg) and shipped from the town of Selkirk in refrigerator cars, and were found in some United States cities to be preferred to the frozen fish heretofore imported. A large business has been since then maintained. The main catches brought from the fishing grounds by tugs and sail-boats to the various islands referred to, after being cleaned, packed, and iced, are brought down to Selkirk from Lake Winnipeg, and to Winnipegosis Town, from Winnipegosis, Cedar, and other lakes. From over a hundred of these remote establishments, with plants valued at nearly \$250,000, the principal summer catches are received at the large refrigerators. That of the Dominion Fish Company at Selkirk is said to be the largest in Canada, if not on the whole American continent, having a capacity of two million pounds, though many times that amount passes through the freezing rooms in a single season. In the large freezers the fish are neatly laid on flat trays, subjected to a temperature of 15° below zero, and exported by the carload when the markets are favourable. The ammonia process has been adopted, the ammonia being forced by powerful engines into vacua, thus reducing the temperature, and the cold gas is then driven through circulating pipes, which pass along the insulated store rooms, where a temperature of 20° below freezing can be readily attained, but the usual temperature is only about zero. The ammonia, after circulating, is restored to its original density by the action of running water and is ready for the circulating process again. In the large refrigerator establishment just mentioned about 3,000 lbs. of ammonia are used, emptying and re-filling being carried out several times in the course of the year.

Unlike the fisheries of Ontario and the eastern Provinces and British Columbia, in which each Province has property rights, the property and jurisdiction are, in Manitoba, vested solely in the hands of the Dominion

Government; and the Minister of Marine and Fisheries, Ottawa, issues licenses, authorizes restrictions, close seasons, etc., for the preservation of the fishery resources. As an effective safeguard against depletion the Federal Government has erected fish-hatcheries (at Selkirk, Beren's River, Winnipegosis, and other places), and vast quantities of fry of whitefish, and various valuable species, are planted each season from these establishments.

NOTES ON THE FISHES OF MANITOBA

Apart from their commercial importance, the fishes of the Province have a scientific interest arising from the fact that they form a fish fauna distinctly marked off from that of the great lakes and eastern waters, and have nothing in common with the Pacific fish fauna. None of the ancient fresh-water types of Canada such as the Gar-pike (*Lepisosteus osseus*, Linn) and Bowfin (*Amia calva*, Linn) occur, though sturgeon of two species are found, but the sturgeon is doubtless, primitively, an anadromous ocean fish. The speckled char or brook trout (*Salvelinus fontinalis*, Mitch.), the lesser whitefish (*Argyrosomus artedi*, Le Sueur), the sea salmon (*Salmo salar*, Linn.), as also the black spotted trout (*S. clarkii*) of Albertan waters, the Inconnu (*Stenodus mackenzii*, Richardson) of the Mackenzie, and certain Arctic and Pacific salmon and trout are absent, and bear out the geologist's view that the Manitoba system of lakes and rivers is unconnected with the eastern and western drainage systems, and really comprises the remnants of a northern expansion of the Missouri and Mississippi system with a former outflow to the south. Geographically these lakes are the western members of the great lake chain lying, for a thousand miles, along the southern margin of the vast Archaean shield which dips, to the

north, beneath the waters of Hudson Bay. Geologically they are all that remain of the vast post-glacial Lake Agassiz, of an estimated area of 110,000 sq. miles, the sediments of which, as the late Dr. George Dawson said, "constitute the richest wheat lands of Manitoba." Near the Cypress Hills on the west and in the opposite direction (south of Lake of the Woods) the Manitoba waters still maintain communication by muskegs and marshy streams with the Mississippi system to the south.

The presence in abundance of a lesser whitefish, not found to the east or the west, viz., the Tullibee (*Argyrosomus tullibee*, Richardson), a soft inferior lesser whitefish or lake herring, and of the Gold-eye (*Hiodon chrysopsis*, Richardson), an ally of the Clupeidæ, a very plentiful and excellent food-fish, emphasises the separateness of this aquatic area, while the presence of the sturgeon and of the Methy or Lake Ling (*Lota maculosa*, Le Sueur) indicates that connections with the sea, such, as geology demonstrates, have occurred, owing to subsidence at various epochs. Certain universally distributed species are found, e.g., the pikes or jack-fishes (of which two species occur, *Lucius lucius* Linn., and *Lucius masquinongy*, Mitchill), both of exceptionally good table qualities, as well as the bearded cat-fishes and carp-like suckers; but the glutinous nature of their eggs may explain their wide dispersion, probably by water birds.

The following list of species is believed to include most of the fishes authentically known to occur, but many other species await discovery in this extensive area of waters where investigations, so far, have been fragmentary and inadequate.

LIST OF MANITOBA FISHES

FAMILY Petromyzontidæ.

Ichthyomyzon castaneus, Girard. The Northern
Lamprey.

FAMILY Acipenseridæ.

Acipenser rubicundus, Le Sueur. The Lake
Sturgeon.

Acipenser sturio, Linnæus. The Common Sturgeon.

FAMILY Siluridæ.

Ictalurus punctatus, Rafinesque. Channel
or Spotted Catfish.

Ameiurus lacrustis, Walbaum. Great Lake Cat-
fish or Mathemeag.

„ *vulgaris*, Thompson. The Dark Catfish.

„ *nebulosus*, Le Sueur. Common Bullhead
or Horned Pout.

FAMILY Caostomidæ.

Ictiobus cyprinella, Cuv. and Valenciennes. Buffalo
fish.

„ *bubalis*, Rafinesque. White or Small-
mouth Sucker.

Catostomus catostomus, Forster. Northern
Sucker.

„ *commersonii*, Lacépède. Common
White Sucker.

Carpiodes velifer, Rafinesque. The Quillback
Sucker.

Moxostoma anisurum, Rafinesque. White-nosed
Red Horse.

„ *aureolum*, Le Sueur. The Mullet or
Red Horse.

„ *lesueurii*, Richardson. Northern Red
Horse.

FAMILY Cyprinidæ.

- | | | |
|-----------------------|---------------------------|------------------|
| Hybognathus nuchalis, | Agassiz. | The Silver |
| | Minnow. | |
| „ | argyritis, Girard. | The White |
| | Minnow. | |
| Pimphales promelas, | Rafinesque. | The Fathead or |
| | Bull Minnow. | |
| Notropis blennius, | Girard. | Straw-coloured |
| | Minnow. | |
| „ | hudsonius selene, Starr | The Shiner, |
| | Jordan. | Spawn Eater. |
| „ | jejunus, Forbes. | The Poor Minnow. |
| „ | atherinoides, Rafinesque. | The Great |
| | Minnow. | |
| Hybopsis storerianus, | Kirtland. | Storer's Minnow. |

FAMILY Hiodontidæ

- | | | |
|--------------------|------------------------|----------------|
| Hiodon chrysopsis, | Richardson. | Western Gold- |
| | Eye. | |
| “ | tergisus, Le Sueur. | The Moon-Eye. |
| “ | alosoides, Rafinesque. | The Shad Moon- |
| | Eye. | |

FAMILY Salmonidæ.

- | | | |
|-------------------------|---------------------------|--------------|
| Coregonus clupeiformis, | Mitchill. | The Common |
| | Lake Whitefish. | |
| “ | labradoricus, Richardson. | Labrador |
| | Whitefish. | |
| Cristivomer namaycush, | Walbaum. | Great Lake |
| | Trout, Touladi or Grey | Trout. |
| Argyrosomus tullibee, | Richardson. | The Tullibee |
| | or Mongrel Whitefish. | |

FAMILY Esocidæ or Luciidæ.

- | | | |
|----------------|----------------------------|------------------------|
| Lucius lucius, | Linnæus. | The Jack-fish or Pike. |
| “ | masquinongy, Mitchill. | The Maskinongé |
| | (erroneously Muskellunge.) | |

FAMILY *Gastrosteidæ*.

Pygosteus pungitius, Linnæus. Nine-spined Stickleback.

Eucalia inconstans, Kirtland. Brook Stickleback.

FAMILY *Percopsidæ*.

Percopsis guttatus, Agassiz. The Trout Perch or Sand Roller.

FAMILY *Centrarchidæ*.

Pomoxis sparoides, Lacépède. The Calico Bass.

Ambloplites rupestris, Rafinesque. Green Rock Bass.

Micropterus dolomieu, Lacépède. Small-mouth Black Bass

salmoides, Lacépède. Large-mouth Black Bass.

FAMILY *Percidæ*.

Stizostedion vitreum, Mitchill. Yellow Pickerel, Pike-perch or Dore.

" *canadense griseum*, DeKay. Grey Sauger or Pike perch.

Perca flavescens, Mitchill. The Yellow Perch.

Hadropterus aspro, Cope and Jordan. Black-sided Darter.

" *guntheri*, Eigenmann and Eigenmann. Gunther's Darter.

Boleosoma nigrum, Rafinesque. Johnny Darter.

" *boreale*, Starr Jordan. Northern Darter

FAMILY *Sciænidæ*.

Aplodinotus grunniens, Rafinesque. Sheephead or Lake Drum-fish.

FAMILY *Cottidæ*.

Cottus pollicaris, Jordan and Gilbert. Olivaceous Miller's Thumb.

FAMILY *Gadidæ*.

Lota maculosa, Le Sueur. Lake Ling, Burbot, Lake Cusk, Losh and Methy.

THE INDIANS OF WESTERN CANADA

By THE HON. DAVID LAIRD,

Commissioner of Indian Affairs.

WESTERN CANADA may be described as extending from the eastern watershed of the watershed Lake Winnipeg basin west to the Rocky Mountains and from the International Boundary to the Arctic waters and the Hudson's Bay.

This territory since first known to white men has been inhabited by four distinct families of aborigines: the Esquimaux, who frequent the coasts of the Arctic Ocean and of the bays and estuaries of rivers opening thereunto; the Dene or Athabaskan, whose habitat extends from the domain of the Esquimaux south to the Peace and Churchill Rivers and west to the Rocky Mountains; the Algonquins, extending from Eastern Canada over the country south of the Athabaskan habitat to the International Boundary; and the Sioux or Dakotah family, whose habitat in Canada is small portions of the prairies south of the North Saskatchewan River.

The principal branch of the Athabaskan family are the Chipewyan, often on account of the similarity of name confounded with the Chippewas or Ojibways who belong to the Algonquin family. Another tribe belonging to the Athabaskan family are the Beavers of the Peace river. The Sarcees, now settled upon a reserve near Calgary, belong to the Beaver tribe. In time long past they left the habitat of the race, moved into the Algonquin country, and remaining there, came to be commonly regarded as a distinct people. The Slaves, Yellow Knives, Dog Ribs, and other small



CROWFOOT

Chief of the Blackfoot Nation. Died 25th April, 1890. Aged 69 Years.
"Crowfoot died beloved by his people, feared by his foes, esteemed by all." Indian Report 1900.



tribes of the Great Slave Lake and Mackenzie River country also belong to the Athabaskan family.

The main divisions of the Algonquins in Western Canada are the Saulteaux or Chippewas, the Crees, and the Blackfoot tribe, which latter originally included the Bloods and the Peigans. The Assiniboinés are the Canadian branch of the Sioux. They separated from the main group, and in time their interests became so diverse that they came to be regarded as a separate people, and in fact joined in alliance with the Saulteaux against the Sioux nation. The Sioux proper in this country are refugees from the United States, who escaped into British territory after displaying some of the worst features of Indian warfare in Minnesota in the year 1862. They had no claim to lands in Canada, but were allotted small reserves and given some assistance in stock and implements to prevent them from trespassing upon settlers' holdings. Most of these Sioux have become industrious and self-supporting.

Apart from family and tribal distinctions the Indians of Western Canada can be grouped into two classes—those of the wooded country, and those of the open prairie. The former made their livelihood mainly by trapping and fishing, and moved as single families or as small family groups. They did not develop any well-defined tribal or band organization. As a consequence there was less conflict among them, and the country which they inhabited was free from tribal wars. They developed, therefore, a more peaceable disposition. Being trappers of fur-bearing animals, they first came under the influence of fur traders.

The Indians of the prairies formed into bands under the leadership of chiefs, and their principal means of subsistence was the buffalo. The different tribes came constantly into conflict: the Crees of the plains and the Blackfeet were continually at war, the Assiniboinés usually siding with the Crees. Sometimes tribal jealousy

and often the mere desire for bloody war and barbaric torture, led to the conflict; but the main cause of strife among the Indians of the plains was the horse. The Blackfeet possessed herds of horses which grew larger from year to year as a result of raids upon Indians to the south and beyond the mountains. And the Crees kept themselves supplied amply with horses for the buffalo hunt by raids on the Blackfeet. The last great fight between the Crees and the Blackfeet ended in a pact made upon the Peace Hills that rise beyond the Battle River—the river taking its name from the fight, and the hills their appellation from the treaty.

The traders made little impression for good upon the Indians, and the mission field being vast and the laborers therein few, it took a long time to bring the aborigines to any extent under the influence of the Gospel, particularly those of the prairie country, who were not readily susceptible to its teaching. Writing as late as 1868, Archbishop Tache described the Saulteaux as "generally fine men," with "a very great liking for intoxicating drink." "War songs," he wrote, "still exist there (the vicinity of Winnipeg), and often in the midst of starvation and privation they undertake journeys of several hundred miles on foot to surprise and scalp an enemy who is generally defenceless, and return triumphantly to perform the war dance and to shout the hideous scalping song."

After the Dominion of Canada, through the British Government, obtained by purchase from the Hudson Bay's Company the transfer in 1870 of all the territory which now forms Western Canada, a comprehensive policy was adopted in dealing with the Indians of the said territory. In regard to all such portions of the transferred country as were required for settlement, or for mining, lumbering or railways, treaties were made with the Indians of the districts successively needed for

such purposes. Though the sovereign right to the soil was held by the Crown, yet it was recognized that there was an Indian title that ought to be extinguished before the land was granted by patent to settlers or corporations. This title is simply an admission by the Government that the Indians should not be deprived of their possessory rights without their formal consent and compensation. Besides the compensation, the Indians were conceded reserves at places generally selected by themselves. These reserves set aside for the occupation of the Indians were in most cases so extensive as to allow one square mile to every five persons, or at the rate of one hundred and twenty-eight acres for every man, woman, and child. Not only were the Indians thus dealt with, but the Halfbreeds wherever the land they occupied was covered by an Indian treaty, on account of their possessing Indian blood, have been allowed lands or scrip to extinguish the share of title which comes to them through that blood.

The Indian treaties made under the Dominion Government since 1870 are ten in number, though one of them, Treaty nine, does not come under the scope of this paper, as it was undertaken in co-operation with the Provincial Government of Ontario. Treaties one and two, which cover the Province of Manitoba, were negotiated in 1871, and the others in different years since, the last being in 1906. These treaties embrace all the territory in Canada east of the Rocky Mountains and south of the 60th parallel of north latitude, except a tract south and west of Hudson's Bay.

In general the compensation granted under the treaties was a payment of twelve dollars for every man, woman, and child on the chief's signing the instrument, and an annuity forever of five dollars per head to the ordinary members of the band, fifteen dollars to each of the headmen, and twenty-five dollars to each of the chiefs. A

uniform suit of clothing befitting these two ranks is given every three years. An annual allowance of ammunition and twine is also granted to the hunting and fishing Indians. And where farming and grazing operations are practicable and engaged in, a supply of agricultural implements, seed grain, cattle, and carpenter's tools are provided. Schools are also established on the reserves where a reasonable attendance can be secured.

It may be considered by some philanthropists that the terms to the Indians were not generous. There was a difficulty on this point. It is not desirable that large numbers of able-bodied men, Indians or others, should be maintained in idleness. The promises in the treaties, consequently, were made moderate. But it was foreseen that, owing at that time to the rapid disappearance of the buffalo, the only resource of the plains Indians, and that with the advance of settlement other large game would decrease in number, a heavy expenditure would have to be incurred by the Dominion Government to keep them from starvation. This anticipation was unfortunately too soon realized. In the eighties the expenditure of the Indian Department for destitute Indians averaged over three hundred thousand dollars a year. Of late this expenditure has been gradually decreasing, the report for 1907-1908 showing that the cost of supplies for the destitute in that year amounted to only \$143,033. When the Indians become almost wholly self-supporting, large annuities would be burdensome to the country and demoralizing to them as wards of the Government. The averaging up, therefore, of the very large outlay that has been incurred in provisioning and educating them during their years of helplessness and tutelage, with the promises made to them in the treaties, has made the allowances to them for the extinguishment of their title fairly liberal.

A few figures will show that this contention is not

over-stated. As the Indians of the plains were totally ignorant of agriculture and the care of stock, farm instructors had to be appointed for grain and vegetable raising reserves, and cattlemen for the stock ranges, to train them for their new duties. These, with agents for reserves or groups of reserves, and inspectors to report upon their work, make the administration of Indian affairs somewhat expensive. Taking this outlay into account, along with \$271,365 for schools, for the supplies already mentioned, and for the provisions under treaty, the expenditure on Indians in Western Canada in 1907-1908 was \$792,979. This amount cannot well be decreased in the near future, because, though the plain Indians are becoming self-supporting, the others who live by the chase, owing to the increasing scarcity of fur-bearing animals and large game, will require considerable assistance from the Government. It may be set down, therefore, as almost a certainty that the expenditure of the Indian Department will not for many years be much less than \$800,000 per annum. This sum capitalized at three and a half per cent. amounts to about \$22,800,000—a fairly just sum to pay for the extinguishment of the Indian title to the lands in the western provinces and territories.

As has been already stated, when the buffalo disappeared, provision had to be made for feeding the Indians of the plains who had depended upon the herds for food, for clothing, and for lodges. Ration houses had to be established. They met the urgent need, but incidentally did not operate for good. Free food does not tend to the uplifting of men, and when the system was once inaugurated, it took long and careful work to bring about its restriction.

In the Blood Agency five years ago 450,000 pounds of beef were issued free to the Indians. During the last fiscal year the issue was only 139,000 pounds. At this

rate it will be seen that the time is not distant when the issue will be restricted to those who are unable, through age or physical infirmity, to provide for themselves. In 1902 the free issue of beef to the Peigan Indians amounted to 216,416 pounds; in 1906 it was reduced to 64,564 pounds. Last year there was a further decrease of 1,604 pounds. This band is now practically self-supporting, only the aged and infirm being provided for. On the Sarcee reserve the free rations continue to diminish towards the vanishing point. In the Stony Agency, where the Indians turn their beef into an abattoir to be held for their own use, there were 6,142 pounds at the credit of the Indians, and to those who had exhausted their supply there were loaned but not given gratis, some 1,000 pounds. On the Blackfoot reserve the earning power of the Indians in the past two years is estimated to have increased fifty per cent., and now, outside of those incapacitated for labour, they are close to self-supporting.

It was thought that because he had formerly lived by the buffalo, the Indian would take more kindly to cattle-raising than to farming as a means of livelihood, but the early efforts to make him a cattle-raiser were disappointing. The Indian rather thought that, like the buffalo, the bovine should live without trouble on the part of man, and that he should be shot irrespective of the time or the season, whenever appetite suggested the desirability of a meat supply. Constant effort is, however, now being rewarded, and the Indian is coming to realize that in cattle-raising, as in every other avocation, work is essential to success. The live stock now held by the Indians of Manitoba, Saskatchewan, and Alberta are valued at about \$1,100,000.

It was difficult to induce the Indian to till the soil. He would put his hand to the plough only to quickly withdraw it. When game was plentiful, he would leave the field for the hunt. The scarcity of game, the pangs

of hunger, the constant urging and teaching of the officials of the Indian Department, and the example of white farmers, whom the Indians saw grow rich through agriculture, at length led them to gradually make some use of the land set aside for them. At the beginning of their farming ventures, occasional failures so discouraged the Indians that it was difficult to induce many of them to resume work, and others continued reluctantly the tillage of the soil without the will which makes labour pleasant and profitable. Now, however, a fair proportion know the good results that the earth, notwithstanding occasional drawbacks, will yield to cultivation, and after failure they return to the tillage of the soil with hopefulness and energy. There, of course, is still much to be done before the Indians avail themselves to the full of the splendid agricultural possibilities of most of their reservations. But the present results are encouraging. According to the last returns, the Indians of Manitoba have agricultural implements and vehicles to the value of upwards of \$71,500, the Indians of Saskatchewan to the value of about \$165,500, and those of Alberta to the value of some \$141,300. In the same year the Indians of Manitoba harvested some 83,000 bushels of grain, the Indians of Saskatchewan 132,000 bushels, and those of Alberta 42,448 bushels. They raised 18,659, 18,649, and 12,353 bushels of potatoes and other roots respectively.

The Blood Indians, one of the groups most averse to agriculture, having a reserve in a portion of southern Alberta, which long was regarded as unsuitable for farming, have been moved by the success of their white neighbors to assay the growing of fall wheat. Out of their funds a complete steam plowing outfit has been purchased, and fifteen Indians have broken 840 acres of land, 600 of which is now under wheat, not in a community farm, but in individual holdings. They have

availed themselves of insurance against hail, and have evinced an unlooked-for interest in their farming operations. Last fall these Indians shipped 20 car-loads of wheat, for which they received \$17,832. The yield per acre went as high as 45 bushels. Chief Running Antelope, who a few years ago scorned the man who plowed and sowed and looked to the harvest for return, had from his grain-growing a cash balance of \$1,309 after every debt was paid. One Indian had a balance of \$1,203, and another of \$1,200.

Fishing and hunting still form a considerable means of support, but it grows smaller as settlement advances. In 1907-1908 the estimated value of the fishing and trapping was in Manitoba \$51,500 and \$72,491; in Saskatchewan \$27,751 and \$80,107; in Alberta \$5,690 and \$17,471.

With respect to the Indian population in the Provinces and Territories embraced within the scope of this paper, various estimates have been formed. The first official one, which was made in 1871, put the Indian population at 20,998. In 1880 the population was returned at 36,185, and in 1885 at 43,932, inclusive of an estimated population of 11,978 in the territory inclusive of the Peace River basin and extending to the Arctic, an estimate which has since been found to be excessive. The last census was made in 1907, and with some later returns gives the following results:—

Ontario, Treaty 3.....	2,927
Manitoba (including proposed extension)	11,300
Saskatchewan	8,043
Alberta	8,109
North-West Territories.....	7,247
	<hr/>
	37,626

Of this number about 28,732 are receiving annuities

under treaty. In regard to their tribal character, these Indians may be approximately classified as follows:— Crees, 12,249; Saulteaux, 10,826; Blackfeet and their kindred the Bloods and Peigans, 2,465; Stonies or Assiniboines, 924; Sarcees, 203; Sioux, 1,029; Chipewyans, Beavers, Slaves, and other tribes of the Athabaskan nation, 7,430; Esquimaux, 2,500. It is practically impossible with the figures available to form a correct conclusion as to the ratio of increase or decrease in the Indian population in the West. It can be safely asserted however that, all things considered, the Indian has not, as is often stated, rapidly disappeared since coming under Government control.

Before the extension of Canada's Indian policy to the territory acquired from the Hudson's Bay Company, and its being policed by the splendid force of the Royal North-West Mounted Police, the Indians were often reduced by famine and epidemics, with which they were unable to cope; tribal feuds and fights continued; immorality was rampant, and but little account was taken of the female portion of the bands. However much it is to be regretted that even a greater measure of good has not been effected, credit must be given for what has been achieved, and from what has been done the Indian Department can with hopefulness look forward to the results which a continuation of its policy will produce. Inter-tribal feuds have ceased, polygamy has been practically eliminated, the position of women, and particularly of female children has been improved, and no agencies are so potential as the efforts of the missionaries and the work of our Industrial and Boarding Schools.

It is true that the pushing of settlement up against many reserves, which until the marked western development of recent years were practically isolated, has intensified the strain which sudden contact with the settled

conditions of Canadian civilization put upon the Indian, unprepared by his environment to readily make use of the advantages, while avoiding the evils of the new order. The history of the progress of civilization shows that it often creates difficulties for those whom it is designed to benefit before removing the evils which it is intended to cure. Where not long ago Indian settlements could only be reached by devious trails or through the bushlands, railways have entered, and in place of scattered Indian dwellings, towns have arisen. With the towns has come the readier access to intoxicating liquor, so tempting to the red man and so destructive to all hope of his advancement. One of the greatest problems has been to find means to adequately cope with drunkenness, which, despite all effort, increases its baneful influence among many of the bands. And with every measure of increase in the liquor traffic goes a proportionate measure of immorality. It is consoling, however, to note that among a goodly number of the tribes the liquor traffic is gradually growing less, that groups are now noted for temperance, and that a healthier moral condition has taken permanent form. It is to be remembered, in justice to the Indian, that cases of dissoluteness generally obtrude themselves on the public notice, while virtue quietly practiced passes unobserved.

Unfortunately tuberculosis, which is the scourge of the white as well as of the red man, continues to claim many victims among the aborigines. But the Indian medical service, hampered though it has been, is producing beneficial results. There is a notion that the ravages of tuberculosis are entirely a consequence of the change from the former roving life of the Indians under tepees to their now more sedentary conditions of existence and to their life in unsanitary and ill-ventilated dwellings. As a matter of fact, the Indian was previously a victim of the dire disease. The Indians, who followed the

buffalo generally wintered in mud-plastered cabins with flat thatched roofs, with scarcely ever more than one door, and usually but one window. The only means of ventilation was the open fireplace made of mud, but this passed away and stoves were introduced, which the Indian, like the white man, preferred because of their greater heating capacity. It is just such of those huts as remain that continue to afford rich breeding grounds for the germs of tuberculosis; and it cannot be too strongly insisted upon that step by step with material progress the Indians must be led to provide themselves with better housing. The Indian himself is beginning to realize this, and, despite the discouraging ravages still wrought by the dread disease of tuberculosis, there is reason to look forward to the day when the Indian will be at least as free from this plague as his more favored white brother. And the reports indicate that improvement in health as a rule keeps pace with improvement in conditions.

Reference has already been made to the large expenditure which is being incurred for the education of the Indians in Western Canada. In Manitoba there are two industrial, nine boarding schools, and forty-five day schools; in Saskatchewan three industrial, thirteen boarding, and nineteen day schools; and in Alberta two industrial, nineteen boarding, and nine day schools. According to the last complete reports there were 10,308 pupils enrolled in the schools, and the average attendance was 6,451. Schools are grouped into three classes: day schools, boarding schools, and industrial schools. The day schools are a distinct class. Between the boarding and industrial schools it is not always easy to draw a clear line of demarcation, for many of the larger and better equipped boarding schools provide a measure of industrial training for the pupils. Indeed, in every case it is insisted upon that as far as possible some manual or

industrial training be given! And in the case of the boarding schools erected within the last few years at Fort Alexander, Fort Frances, and Sandy Bay, it was specially arranged that means should be provided for giving the boys such training as would enable them to take up the tillage of the soil after they had finished their school course. Day schools have never been regarded as very effective agencies of Indian education, and indeed with the small salaries paid it would scarcely be reasonable to look for any large results. There are points, however, at which day schools are capable of doing and do effect good.

The work of the class-room is not allowed to absorb the whole time and attention of the Indian boys and girls. It is sought to have the hand trained as well as the head. The girls are taught household duties by taking part in the regular domestic work of the schools; they learn to cook meat and vegetables and to bake bread by seeing such cooking done and by helping thereat. They are taught to care for their clothes, and by example as well as precept are taught the pleasures as well as the advantages of cleanliness. They devote some time each week to sewing and mending, and their handiwork in this direction has been praised by many competent judges. Every industrial school takes measures to train the boys in practical agriculture, and in some of the boarding schools there are farming instructors who teach the rudiments of farming. No attempt is made to teach scientific farming, for the Indian has not reached a stage, and must not be expected to for many years, where he can grasp the significance of the chemistry of the soil. Effort is being confined to measures designed to make him familiar with the handling of the plough, and with the sowing and reaping of the grain. Carpentry and blacksmithing are also taught. It is not, however, aimed as a rule to give such technical training in these

branches as would turn out finished artisans, but rather to make the Indian boy when he leaves school competent to do the carpentry work which a handy white farmer does, and to be able to make the ordinary repairs to implements, wagons, and harness. Indian boys have in one respect an advantage over the ordinary boy. As has been already stated, when the treaties were made, liberal reserves were set aside for the Indians, and now every Indian boy, when he leaves school has awaiting him an ample area of land, in most cases very good, and in all cases cultivable, upon which he can at once settle and make a home.

Each year seems to make the Indian more amenable to the restrictions of school life, and more ready to benefit by the advantages afforded. Indeed, the children were not at any time most to blame, for, apart from scattered individual cases, they seemed to appreciate what was being done for them. Many of the parents, however, suspicious of the new order and preferring to have their children grow up like unto themselves, often induced boys and girls, who had been placed in the schools, to desert, or in their intercourse with them so worked upon their minds as to make school life seem irksome, and rendered the children restive of discipline.

It would be invidious to make comparison among the several schools. The standing of each can be pretty correctly gauged from the particular reports which are published by the Department. An unbiased reading of these reports leads to the conclusion that it would be difficult to find more effective agencies for the uplifting of the Indian and the placing of him eventually in the position of a self-supporting citizen of the country. It is only about one-third of a century since the principal treaties were made with the Indians of the plains. Though this term is a large proportion of man's allotted span, yet it is but a short period in the evolution of a

race. It is a question whether in the history of aboriginal tribes the world over, such progress towards civilization can be shewn in the same space of time as is indicated by the foregoing statistics. It has taken many centuries to bring the barbarians of Europe up to their present state of enlightenment; and though industrial and other education, the bath-tub and the flesh brush cannot make a red-man white, yet it has been amply proved that he is capable in a very few centuries of becoming the equal of his pale-faced brother.

THE GAME FIELDS OF THE WEST

By J. P. TURNER,

Secretary Manitoba Game Protection Association.

IN this age of huge enterprise and great achievement, not many of those whose daily life draws them ever deeper into the meshes of the complex net of modern commercialism, ever pause in all seriousness to view the outside world. An age of tireless ambition and splendid attainment goes on apace ; but in the great centres of population the tramp of feet and clatter of wheels, the clang of warning bells, the heavy monotone of ceaseless traffic, the smoke and dust and grime have blotted out from the lives of many that supreme exhilaration of soul and body, that sense of freedom and unrestraint, to be found only in the breadth and sweep of the great out-doors.

There are granted to us in this life many opportunities for honest diversion and pursuit other than in the incessant struggle for material gain and to draw the best from the world in all that makes for moral and physical uplift we must at times turn our steps far from the noisy street. The lover of the country, the sportsman, the naturalist, in fact all wholesome-minded citizens, irrespective of professional or commercial pursuit, know the supreme content attainable from close mental and bodily intimacy with the out-door world. Words fail to plead the fascinations of the wilds. The charm and beauty of the autumn season; the grandeur and sense of freedom; the clear blue skies; the winds playing and whispering through the nodding flowers and grassy billows; the shrieking winter storms; the glory of the break of day as the shadows slink away and the sun

steals mysteriously across the open; the beauty of its close as the shadows creep back, the day slips away and the star-lit night comes on—in such elements do we find that “something” which we call the Spirit of the West.

In emerging from the obscurity of pioneer days, in hewing from the primeval forests her first rude clearings, in sowing the seeds of settlement across her wide untimbered prairies, and in planting on river, lake and plain the foundations for great cities, the Canadian West has maintained in her making a wondrous wealth of wilderness and rural beauty. The pen can here commit to paper only fragmentary pictures of this Last Great West—a land the very atmosphere of which must be breathed to be rightly understood. And only in brief form can we review amidst its natural environments, that great game heritage so essentially a feature of the Western wilds.

When the rugged shore lines of primitive America first loomed before the roving adventurers of the Old World, and the eager crews scrambled up the lonely cliffs where wilderness and ocean met, the country fairly teemed with wild life. Innumerable deer roamed through the forests where now the great business centres of modern America palpitate with the thousands of this heterogeneous race; on the open plateaus stretching inland from the Alleghany Mountains, where wealthy country mansions now nestle amidst the conventional luxuries of their well-kept estates, the mighty bison raised his shaggy head to stare and wonder at these strange intruders. When the gallant explorers of New France first ascended the St. Lawrence River, now the main artery of the Dominion's commerce, they found the wapiti living where to-day the very mention of its name arouses only a blank stare among the traditional country folk. The Puritan of later date, if hungry, shouldered his gun and disappeared beyond the clear-

ing to return shortly with a fat turkey. Along the country of the present eastern States, the heath-hen, prototype of the western "chicken," rose in coveys before the traveller's approach; and twice a year from north to south and east to west, the sky was darkened with myriad hosts of pigeons bound to and from their northern breeding grounds. The bison soon turned his bowed head westward, never to return, and massing in his fabled herds beyond the Mississippi, began his brief struggle for existence against the advancing hordes of Europe. The wapiti or elk was assailed on all sides and driven to the wildest corners of the West. The turkey now lingers apprehensively in the scattered brush-lands of his last retreats; the heath-hen has long since ceased to sound her booming call across the uplands; and the pigeon has become a mere memory of the past.

Moving rapidly from east to west this stupendous elimination of wild life in America has been both melancholy and relentless, yet with few exceptions the finest game animals and birds of the northern continent still find room and tolerable protection in the Great North-West. The bison will never again roam at large over the huge prairie ocean as in bygone days. Empire-building has been of far greater importance than the preservation of a million or so of wild cattle; but for long years to come the moose and wapiti, caribou, prong-buck, deer, mountain sheep and goat, and all the long list of feathered game will here survive civilization's encroachment if but reasonably protected.

Over the north-eastern half of Manitoba and out beyond the Saskatchewan country there lies in marked contrast to the Great Prairie of the Canadian West, which sweeps from the Red River to the foothills of the Rockies, a vast, thinly-settled forest. Here, far from the steel-shod roads of commerce and the little frontier-towns, lies the wilderness; and though showing the

ravages of forest fires and the bite of the woodman's axe, it still defies the destroyer's hand and holds aloof the persistent tread of settlement. Here in one of the finest game-lands of modern time the mighty moose and lordly wapiti still live and thrive. Across the huge prairie ocean of the West so recently the pasture land of countless herds of buffalo, where innumerable towns have risen as tho' by magic above the ruin of trading post and Indian camp, and where thousands of home-seekers have flocked in the feverish race-movement from the East, leagues upon leagues of rolling prairie as virginal and wild as ever filled the human vision yet remain, where the fleet-footed prong-buck or antelope lives as in the frontier days. Far away in the heart of the Rocky Mountains, where the sun-kissed fields of perpetual snow lie above the timber belts on the shoulders of the continent, and where the mountain streams trickle down the long defiles to surge eastward in majestic rivers to the plains, midst wild sanctuaries of crag and ledge, dwell flocks of mountain sheep and goats. Westward from the Great Lakes and northward across Keewatin and Mackenzie to the barren Lands, lies the home of the caribou, and everywhere throughout the length and breadth of the West are scattered tracts of forest, marshland and prairie, so prolific of wild life as to baffle description.

The vast, natural range of the moose occupies the forest regions of the northerly half of North-America from coast to coast, with the chief exceptions of portions of British Columbia and most of the country contiguous to Hudson Bay. Assisted, not only by its superior cunning and capabilities of self-protection, but by the impenetrable nature of its forest home this giant deer can be said to have held its own against the white man's lust for killing. But next to the bison, the wapiti has suffered more than any American big game, and

though it once roamed from the Atlantic to the Pacific and from New Mexico to the valley of the Saskatchewan, the most easterly portion of its range now lies in Manitoba, where with the exception of north-western Wyoming it is probably more plentiful than in any other part of the continent.

In the woods of Maine and New Brunswick, the moose is hunted in a manner planned to ensure the taking of either trophies or vension with the least possible exertion upon the hunter's part; and to be successful the hunter requires no knowledge of the animal nor need he move himself to unusual exertion, other than to shoot at the right spot when the guide has "called" the quarry within easy range. But in penetrating the forests of the North-West, the hunter meets with the grandest and wildest conditions of the hunt and must depend for success almost entirely upon his own skill and endurance. Here in the sublimity of the winter forest the chase narrows down to tracking or stalking and even though no more than a fleeting glance of moose be seen in a day's tramp, Nature will simply reward him who loves her for her own sake rather than for a set of antlers on the wall. Penetrate the timbered country almost where you will and you will find moose tracks leading seductively away into the forest aisles. Here you will find nature running riot in a bewildering chaos of muskeg and ridge, rock and swamp—in summer an endless sea of green, palpitating with wild life; in winter a huge, frozen solitude. Tangles of forest growth hedge you in on all sides. Deep-furrowed heaps of storm-tossed trunks lie piled in countless confusions of decay, while from the tangled roots and wreckage underneath the young straight-stemmed forest of second growth springs up. Or where the forest fire has swept along bare, sullen wastes of blackened tamaracs rear their branchless tops above the swamps. Here and

there between the dense belts of forest lie broad, park-like ridges, over which the jack-pines grow planted and spaced off by Nature's hand with wonderful exactness. Groves of poplar and birch, hazel and willow thickets, tamarac and cedar swamps spread away in endless succession towards the barren tundras of the North. Such is a rough description of the moose country of the West. When winter has tightened the forest land beneath a rigid grip of snow and ice, the camp is made. Robbed of the charm of other seasons the frozen wilds yet have a beauty of their own and the very spirit of the West instils the hunt. The impulse to move on and into the heart of the whitened world stirs stout hearts and limbs to tireless action. The strange traceries of the wood's creatures in the snow; the frost-tanged air; the long and patient stalk; the exultant kill and at last the ruddy glow and comfort of the little camp—from such features of the hunt do we reap for future years a harvest of pleasant memories from the past.

Though found in Manitoba and less frequently across the northern portions of Saskatchewan and Alberta, the wapiti is of necessity more fastidious in its choice of surroundings and more local in its distribution than the moose. Though most of the herds now existing are found in mountains or hill-country, it roamed freely over the Western plains ere it was forced to seek refuge in the wildest and most inaccessible retreats. Owing to its gregarious habits and the comparatively open character of much of its Western range, it had little to protect it against the ruthless warfare waged upon it in the winning of the West; and to the fact that it will adapt itself and thrive under widely different conditions, can thanks alone be given that it has not followed in the bison's wake. It is the most imposing, the stateliest, and the grandest type of all the antlered tribes on the earth and like a defeated remnant of a once powerful clan, it

has chosen from its former range of half a continent the wildest, pine-clad mountains and lofty uplands in which to face the final tragedy which would forever seal its doom. The moose loves the lower levels of the dank, marsh-strewn forest wherein to glean his fare of willow browse and water-growths, but the royal wapiti seems to revel in the grandest scenery Nature has to offer. Where the giant Redwood and Douglas firs deluge the rolling bases of the Rockies in perpetual gloom, or where the rugged, brush-clad hills of Manitoba rise in majestic skylines from the plains, the wapiti has found the last wild strong-holds of his race.

Not so long ago but that many can recall the time, the wapiti was to be met with almost anywhere in the wooded tracts of the Canadian West. In the Turtle Mountains and the Cypress Hills along the American boundary, in the foothills of Alberta, and through the cotton-wood belts of the western river-bottoms it was plentiful up to the late '70's. But it is now only to be found in several localities along the northern outskirts of its former range. In the wild area between Lakes Winnipeg and Manitoba it is plentiful; over the hills of the Riding and Duck Mountains in north-western Manitoba large scattered herds still roam; and across northern Saskatchewan and Alberta and into the valleys of the Rockies small numbers wander restlessly back and forth.

All that has been written and told of the far-famed stag-hunting of the Scottish Highlands or of the wild adventure of moose-hunting in the American forest, can not excel in point of interest or adventure the elements which surround the hunting of this noble deer. True, one may stumble upon it at times under circumstances sweet to the meat-hunter's heart; but under normal conditions no game the world over is more worthy of the practiced skill of the clean-minded sportsman. Now a frequenter of uplands and timbered ridges

it leads the hunter into the midst of the wildest corners of the West and extols a tribute of unfaltering perseverance and wood-craft from him who would follow it unaided into its wild retreats.

In the wooded regions of the North-West frequented by sportsmen probably more uncertainty attaches to the hunting of the caribou than to that of any other deer. In the fur country of the far North the barren ground caribou presents an almost ridiculously easy object of pursuit during its bi-annual migrations to and from the bare coast-lines of its Arctic home; but the larger woodland caribou of lower latitudes is an almost constant sojourner of the great moss-grown muskegs and is more difficult of pursuit and approach. From Newfoundland to Alaska the caribou, or American reindeer, is found in an almost hopeless diversity of species; but much as the individuals from one locality may differ in weight, color and character of antlers, from those of another, there seems little necessity to sub-divide them beyond the two general types. In Western Canada the woodland caribou is found in the low, coniferous regions of the Lake of the Woods, thence northward beyond Lake Winnipeg, where its range gradually overlaps that of the barren ground species, and westward into British Columbia. In comparison to other deer it possesses a strange perversity of character and habits. Its favorite food consists of the dry, astringent mosses that clothe the muskegs and festoon the trees; with its razor-edged hoofs and slithering gait it is at ease upon the barest ice; hair covers its broad, bovine muzzle; and the female annually grows a set of antlers. Ever restless and on the alert the caribou of Manitoba and New Ontario is no easy prey for the most seasoned hunter; and as it rarely stays long in one locality but continually moves in small travelling herds from one treeless savanna to another, it is exceedingly difficult to overtake. On

the mountain sides it is more easily approached by stalking, and as the traveller proceeds northward he will find it correspondingly easier to bring to his rifle.

Across the plains from Montana to the valley of the Battle River and from the Elbow of the Saskatchewan to the foothills of the mountains the antelope or American prong-buck, is still tolerably plentiful. Barring the buffalo, no animal claimed more attention from those whose fortunes led them hither in the frontier days; and upon this fleet-footed dweller of the open wastes the traveller of the early West relied much for his daily fare. It has long since ceased to provide a staple necessity, but it still clings tenaciously to the treeless slopes of the open country and with surprising resourcefulness continues to elude civilization's intrusion. Though it has learned many of the white hunter's ways and the possibilities of the modern rifle, the mode of hunting it has changed little with the lapse of time. Riding away from the last vestige of settlement the hunter scans the sky-lines and valleys before him till a band of antelope appear in the far distance. Then begins a long and not always successful stalk under the cover of surrounding crests and coulees and as the location of the animals is approached the hunter dismounts and stealing cautiously to the top of a commanding rise prepares to open fire on the unsuspecting herd just beyond. But to his dismay he will more often reach his point of vantage only to catch a fading vision of his intended quarry as the herd goes sailing away beyond the succeeding hill tops. Returning to his pony he resumes the hunt, working over the long rises and depressions of undulating pasture, often following the old, deep-cut buffalo trails which wind away towards the distant lakes and watered hollows in the plains. Perhaps he may come unexpectedly over the brow of a hill and get an unlooked-for shot at the fleeing form

of some old buck, who, wandering off alone, has loitered here to enjoy a quiet siesta on a sunny slope; or again sighting a distant band he may repeat the long, circuitous stalk with happier results. Such hunting carries the rider into the very heart of the Western plains. Some would say that imagination could not picture a more dreary aspect of land and sky; but others recognize a peculiar attraction and charm in this naked space and immensity which rolls away into the blue distances like the halted upheaval of an ocean.

Of all American deer the white-tail is the least effected by settlement and the most general in its distribution. It is by nature a frequenter of tangled brush lands and wooded valleys and strange to say, it is more often met with in the belts of wild, scrub-country bordering on the settlements than in the deep forests frequented by the caribou or moose. It responds readily to protective measures, adapting its ways, like the stag of England and Scotland to semi-domestication if necessary, and thus it is to-day the typical big game of Eastern Canada and the southern and eastern States. It flourishes under a host of different names from Mexico to Manitoba and from the Atlantic to the Rocky Mountains. It is the "red deer" of the lower Canadian and Ontario woods, the "Virginia deer" of the eastern South, the "jumping deer" of Manitoba and the Canadian West, and elsewhere the bearer of almost endless misnomers fashioned from the whims and fancies of its pursuers. Thousands upon thousands of white-tails annually fall to the rifle in the older hunting grounds of Canada and the States, but in the North-West where larger or more valued game demands the hunter's attention it is little sought for, and in Manitoba at least is rapidly increasing. The favorite mode of hunting it in Eastern Canada and the States is by hounding, the dogs doing the actual hunting while the shooter takes his stand on some likely

run-way and by dint of patience and indifferent sportsmanship awaits results. In the West hounds are rarely if ever employed, and never legally, and much the same rules must be followed in pursuing it as in moose or elk-hunting. No deer is more secretive and graceful in its movements than the little whitetail, no game knows better how to tangle and elude the hunter, and by doubling and circling back and forth in a small area of brushland, no animal will leave a trail so intricate and confusing by which to baffle its pursuers.

The mule-deer or black-tail is typically a deer of the West and like the wapiti has rapidly disappeared from many localities, owing to the open character of its haunts. It shuns the low-lying valleys and thickets in preference for broken and exposed hill country or mountain sides, and being sometimes curious to a fault upon the approach of danger, and unable to employ the scanty growths of its favorite uplands in eluding detection, it often presents a comparatively easy mark to the practiced rifle-shot. Through the Canadian West the name "jumping deer" is commonly applied to it also, and with more reason as its stiff-legged and almost awkward motions when running bear rude contrast to the white-tail's symmetrical leaps and bounds. It is widely distributed over various portions of the West and across the mountains to the Pacific Coast. The hunter who picks up the black-tail's track on a clear morning in early winter and hopes ere night-fall to bring it to bay must be keenly alert and ready to act quickly in spite of the animal's shortcomings in habits and surroundings. In most cases he will be led away over bare hill-tops, through gullies and broken-ground, out across park-like expanses and occasionally into brush-checked creek-bottoms; and when least expected the erect ears and antlers will suddenly appear before him either outlined in bold relief upon some rising knoll or

blended in a patch of grey and brown amidst the tangled woods. Then must the eye and finger act together in ready aim, for with the first mis-directed shot the deer has vanished and the disappointed hunter relinquishes the chase, ravenously hungry and exhilarated from the hunt, but minus other reward for his long and tedious tramp.

To seek the wild creatures of the mountain tops the hunter leaves the great alluvial plains, passes the intervening foothills, plunges into the depths of canyons and timbered valleys, and after days of toil toward the pinnacles of the continent, assails a land of sky and glacier far above the world. Here from the wing-point of the eagle the eye falls upon a thousand varied scenes staged in terrible immensity and chaotic grandeur; and here on the rugged back-bone of the West where the foot of man but seldom treads, are found the dizzy pastures of the mountain sheep and goat.

As compared with the Rocky Mountain big-horn, the mountain goat is a dweller in the most exposed and unprotected elevations. In places where no other creature may follow and at which man might well shudder in the bare thought of reaching, the white goat of the Rockies is as much at ease as the sea-fowl on her wind-swept crags. Along the narrowest of overhanging ledges where the smallest crevices or irregularities in the mountain sides often afford the only footholds, it will pass with sure-footed precision, cropping the protruding tufts of vegetation as it goes. Rarely does this uncouth denizen of the mountain tops descend to the timber belts or valleys, but contented and at home it dwells amidst the wide snow-capped slopes and frowning cliffs, serenely oblivious of the world beneath.

The big-horn roams the upper levels where the great slides and glacier beds have seared the mountains and left their time-worn pathways down the rocky wastes,

or wandering to the fringes of the stunted forest that struggles upward from the valleys, it seeks protection from the bleak seasons on the heights above. Stout-hearted and rugged must be the man who would hunt the big-horn or mountain goat ; and the supreme test of human perseverance will be wrung from him who has set his face to follow amidst the stupendous masses of the Rockies, this most exacting and difficult of big-game hunting in the West.

Far away in the semi-tropical bayous and lagoons bordering on the Gulf of Mexico, where the sun pours out his latent heat amidst the winter clouds, where the dull rumble of the surf along the sand-ribbed beaches lulls to sleep the drowsy world of marsh-strewn waters, there rests in quiet content a vast host of feathered life. One lazy day succeeds another, the sun mounts higher in the heavens, a strange restlessness moves across the waters and lifting with the south winds from the Gulf long streams of noisy wildfowl move across the sky. The winter wanes upon the prairies of the West; with crush and turmoil the rivers break their icy bonds; beneath the crooning winds the tumbled drifts of snow shrink and sink away; little lakes awaken 'midst a thousand widening pools; frogs chant their endless chorus from the sodden fields; and in the silent watches of the night the sound of hurrying wildfowl bound to their northern haunts heralds the coming spring. Day after day and through the frosted nights the winnowing of beating wings goes by, and every lake and lowland marsh and slough stirs from its winter sleep.

To the lover of the wilds the brief buoyancy of spring is only rivalled by the painted witchery of the autumn months. No other time of the year on the Western prairies, is so alluring or so full of nature's sorceries and attractions as that which follows the fading summer.

It is the season of ripened maturity and when the wild fowl rise from their vast nursery of the north to return to the bays and marshlands of their southern home, the sportsman turns afield with dog and gun. As the Indian summer draws her hectic glow across the dying year and the night-frosts deck the lowlands in their robes of brown, the muffled echoes of the hunt sound far and wide across the prairies. Peculiarly attractive is a morning on the great duck marshes. The first pink flush of dawn creeps up the eastern sky, transforming the cold, limpid waterways to sinuous-colored reaches that interlace in all directions the endless growths of reeds and sedge. To westward the vast levels of marsh lie dark and sullen beneath the lingering coverlet of night; and the morning star low-hung upon the sky, grows pale before approaching day. Preceding the first faint signs of dawn, no sounds seem to mar the expectant silence of the lonely waters; and over the lowlands and marshes there floats a penetrating chill. As the sunrise steals out across the sleeping world of swamp, the sounds of restless wildfowl spread in all directions, and the clammy night-mists lift and vanish from the marshes. A cold breeze springs up, rustling through the withered marsh-growths; ruffling the dormant waters into little waves that lap among the reeds. As the light increases little flocks of ducks speed across the eastern sky, then more flocks, big and small, in lines and clusters, then it seems as if a continuous army of wildfowl streams far and near, and in the thin cold air the booming of the guns rolls back and forth across the marshes.

When the harvest clothes the land in realms of gold, the prairie chicken flocks to the stubbles of the West. This is the typical game bird of the open country and is as characteristic of the prairies as the bison formerly was among the animals. It is doubtful if man's fancy could conceive any grander game birds, or game that

could give more profound satisfaction in everyway to the lover of dog and gun than the two varieties of grouse commonly called "chicken". Few game birds the world over can boast of superior beauty. Vigorous and rugged they are fitted to withstand the severest tests of winter, and as they rise in covies from their scanty shelter they offer easy wing shots to any who would seek change and recreation in the wide freedom of the prairies.

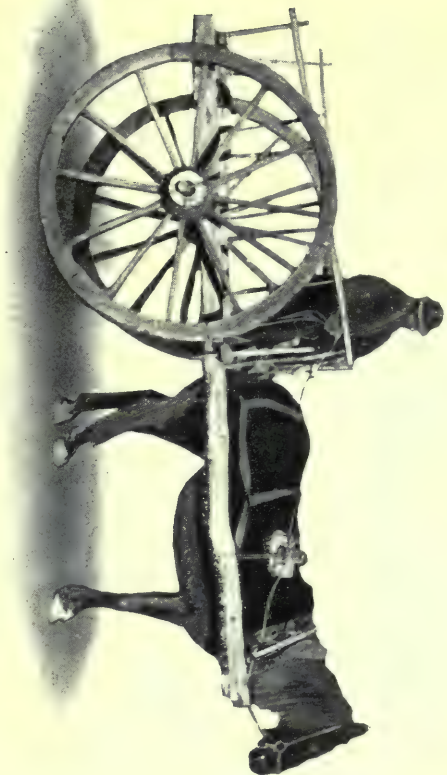
Almost endless seem the haunts of small game. We might go on and wander into the brushy uplands of the ruffed grouse, across the soggy snipe marshes, over the low-lying beaches where the shore-birds gather, and into a thousand wild corners, replete with life. Such is the outside world, the nation's playground. By upland and meadow, through sedge-grown marshes, and into the forest depths the sportsman turns his steps. Here no cares nor worries born of the inner world of toil and strife find place; but round the camp fire and in the hunting lodge are found the truest friends, the most lasting friendships, and above all that splendid freedom and health of outdoor life so essential in the making of the West.

TRANSPORTATION IN CANADA

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Canadian Pacific Railway Company.

TRANSPORTATION has been a serious problem in Canada from the beginning, as was necessarily the case in a country of such enormous area. In early times, when France was in possession, the immigrant followed the rivers. First of all, however, he crossed the Atlantic in vessels of 200 to 400 tons, the voyage lasting two or three months, with scurvy or typhus usually raging on board. On entering the St. Lawrence the ships anchored at night-fall; the charts of the river were imperfect, and there were no lights, except here and there a kettle of blazing pine-knots hung on a tree outside a King's post. If he did not join the fur-traders, the new settler began clearing the forest in some seigniory, for a feudal land tenure, based on the Custom of Paris, existed down to 1854. As may be seen to this day, the French Canadian farms were very narrow and very long, this mode of subdivision giving every holder a frontage on the river, bringing the people closer together, brightening their social life and affording them better protection against the Iroquois. The St. Lawrence and its affluents were the channels of such primitive trade as was carried on in the interior. Commercial intercourse with the British and Dutch Colonies to the south was prohibited, although many a package of beaver was conveyed down Lake Champlain or the Kennebec and bartered for English goods. Vessels built at Quebec with the aid of bounties, carried lumber and flour to the French West Indies and Acadia, but the chief export trade, that in peltries, was done with France.



A Typical "Red River Cart" used for Transportation in the West
until Twenty five years ago

In those times the maritime nations of Europe were seeking a short route to Asia. Jacques Cartier, Champ-lain, and many others supposed from what the Indians told them that, if they sailed up the St. Lawrence to the middle of the Continent, they would meet waters flowing the other way, down which they could sail into the Oriental seas. So sure were they that this would turn out to be the true North-West passage, that when some of them got to Lachine, a few miles west of Montreal, they fancied they were on the high road to China and accordingly gave it that name. Two centuries later it has become possible to reach China via Canada, not, however, by the St. Lawrence, but by rail as far as Vancouver. Although France has lost her North American Empire, the names of her missionaries and explorers will live forever in the history of the Continent. They discovered the Mississippi, Lake Superior and the Red River of the North; established posts where Chicago, Detroit and other Western American cities now stand, for, as one of them said, they had a remarkable instinct for good situations, and did much then, and later, for the Canadian North-West. We owe not a little to those intrepid men, who sallied forth into the wilderness with no selfish motives, but with the object of extending the King's dominions and promoting the glory of God.

When the colonisation of Upper Canada commenced under British rule, the immigrant in his Western journey still followed the water routes, for there were as yet no roads. The canoe or Durham boat containing his worldly effects had to be dragged by oxen through forty miles of rapids between Montreal and Kingston, or, where that was impossible, portages had to be made through the forest. The cost of procuring fresh supplies and of shipping produce to market was enormously enhanced by the difficulties of moving them up and down rivers in their natural condition. It soon became apparent that,

if the country was to make any substantial progress, it would be necessary to build canals at various points on the St. Lawrence and its principal tributaries. The local advisers of the Imperial Government favoured the project, and, though they may have attached more importance to its military than to its commercial aspect, Canadians are greatly indebted to them for the impulse they gave and the substantial aid they furnished to the movement. Between 1820 and 1850 the main rivers were tolerably well equipped with canals, locks and dams, most of which have since been enlarged, to meet the growth of traffic. The Lachine Canal was the first to be built, but the most important was the Welland. Many of the United Empire Loyalists who came to Canada at the close of the American Revolution, entered by way of Niagara, and gradually pushed their settlements into the Western Peninsula of the Province. Their surplus supplies could not be conveyed to Montreal within a shorter period than six weeks to two months. (It may be interesting to recall that the ocean rate on general merchandise from Liverpool to Montreal was £1. 2. 6 per ton, while for the next 400 miles westward, by the St. Lawrence, it was £6. 12. 9.) The Peninsula was extremely fertile, and whole colonies of settlers were flocking in from the United Kingdom. But unless a canal were cut through Canadian soil from Lake Erie to Lake Ontario, a distance of 27 miles, to overcome the obstacle to navigation presented by the Falls of Niagara, it was clear that its trade with England would be diverted from the St. Lawrence route to the Erie Canal and the Port of New York, a state of affairs which might entail serious political consequences. The construction of the Welland canal saved the situation, and it soon became a formidable competitor to the Erie canal for the traffic of the Western States.

Such, in a few words, was the origin of the Canadian

canal system. The canals on the St. Lawrence from Montreal to Lake Erie are, all told, 70 miles in length. Those on the Ottawa, Rideau and Richelieu rivers and Lake Champlain are not so long. It is not easy to ascertain the first cost of these canals, but the total expenditure on their construction, reconstruction and upkeep, together with that on inland harbours, has exceeded \$100,000,000. Tolls were abolished some years ago. In the United Kingdom the canals were built by private capital, and some have passed under the control of the railways. The construction of the Welland canal was undertaken by private capital, but, fortunately for us and fortunately too for the shareholders, the company had to abandon the project. All our canals without exception are now owned and operated by the Dominion Government. For seven months of the year they render good service in keeping down rail rates, besides transporting a considerable tonnage of the bulkier kinds of freight. The "all-water route" from the head of Lake Superior by the Welland canal to Montreal usually determines the rate on wheat from the Canadian West to the seaboard, just as the Erie canal does for grain from Buffalo to New York.

The "all-water route" via the St. Lawrence has not, however, altogether fulfilled its earlier expectations. It obtained a large share of the traffic of the Western States thirty or forty years ago when the wheat-belt of the continent lay round Lake Erie and Lake Michigan, and the grain was carried East by small sailing vessels, which traversed the Welland and lower canals at their leisure and had nothing to fear from the railways of the day. Such conditions no longer prevail. The wheat-belt has extended to the Canadian North-West, Minnesota and the Dakotas, and the present output there and elsewhere in the West is far in excess of the output of former times. There are now 40,000,000 people in the States

bordering on or served by the Great Lakes. An immense traffic has arisen between Lake Superior and Lake Erie, the former sending down wheat, iron ore, lumber, and other commodities, and taking back coal and general merchandise. Before the recent depression, over 50,000,000 tons of freight, valued at \$550,000,000, passed through the locks at the Soo in a single season, that of 1906. The Welland and St. Lawrence canals have a depth of 14 feet, whereas between Lake Erie and Lake Superior there is a 20 or 21-foot channel, which has enabled the United States companies to create a vast fleet of steam vessels, most of which are beyond the capacity of the Welland. Although Canadian vessels are excluded from the inland or coasting trade of the United States, our own fleet on the Upper Lakes is growing rapidly; but many of our vessels are also too large for this canal. Some carry wheat to the Lake Erie end of it and "lighter," since boats carrying more than 75,000 bushels cannot get through without "lightering," whilst the larger vessels sail to Georgian Bay ports, transfer their cargo to the elevators, and steam back to Fort William or Port Arthur. The grain is transported from the elevators by Canadian railways to the ocean steamers at Montreal. In like manner, United States steam vessels, of which many are of the tonnage of a modern ocean steamer, run from Duluth and Chicago to Buffalo, and turn over their grain, not to the Erie canal any longer, but to the railways, which haul it to New York, Boston, or Baltimore. Finally, a great deal of grain, from Canada and the United States, is now carried to the seaboard from the place of production in the West by "all-rail." This has been rendered possible by the improvement of road-beds and the employment of more powerful locomotives and more capacious cars. When business on the Upper Lakes is slack, as was the case recently, Canadian vessel owners on our "all-water

route," reduce the rates to Montreal to so low a figure that a deluge of United States export grain goes to that port, with the result that protests are heard from New York. A natural water-way such as that of the St. Lawrence can never become a negligible factor in transportation. It is worth noting, also, that the Canadian "water-and-rail" routes to Montreal are, or can be made, considerably shorter than the United States "water-and-rail" route to New York. Our Georgian Bay ports are much nearer Duluth and Chicago than Buffalo is, while the rail journey from them to Montreal by a new branch of the Canadian Pacific Railway will be 80 miles less than that from Buffalo to New York.

The State of New York is enlarging the Erie canal to allow of its admitting 1,000-ton barges, and various canal schemes of a more ambitious character are talked of in the United States. The Canadian Government contemplates deepening the Welland canal. This, however, would not be of much avail unless the canals below Prescott were also deepened. Meanwhile the Georgian Bay Canal project, estimated to cost \$100,000,000, is receiving support in various quarters, notably from the districts where the money would be spent. Whatever the next few years may bring forth, the Canadian people will make any reasonable sacrifice to ensure the transport of Canadian traffic by Canadian routes. Manifestly it is their interest to do so. The old Roman said that no estimate could be formed of the future wealth of a district that possessed fifteen miles of olives and vines. But what shall be said of the future of a region like the Canadian West, which, with a present population of a million, has still 250,000,000 acres of black loam uncultivated? In another generation it will contain more people than all the rest of Canada, and in time to come, probably more than there are to-day in the Three Kingdoms. The possibilities of the West

are so great that one can hardly exaggerate the importance of adopting a liberal policy, which shall retain the traffic all the way from the wheat-field to Europe in Canadian and British channels.

No sooner had the early canals been completed than it became necessary to undertake the construction of railways in Upper and Lower Canada. The canals had developed in some degree the basins of the rivers and lakes. The introduction of the locomotive enabled settlers not only to enter Upper and Lower Canada, but to pass into the vaster regions beyond. Our neighbours in the United States began to build railways in 1830, and, private capital being scarce, the Federal, State and Municipal Governments, during the next forty years, voted liberal aid in money, land and guarantees. Canada followed their example, and, in proportion to population and resources, carried that form of paternalism to a greater length. The Imperial Government gave initial assistance by guaranteeing a loan of \$7,500,000. Canada's credit in England was not good, for, after one or two local railways had been built, a rebellion broke out over the question of Responsible Government. Moreover the abandonment by England of the policy of Protection, which included the preferential treatment of Colonial exports, dislocated our trade for a time. One of the first railway surveys was that carried out by Captain Yule of the Royal Engineers, who laid down a line between Quebec and St. Andrew's, in New Brunswick, through territory belonging at that time to the British Crown. Unhappily, in 1842, the Ashburton Treaty—Lord Palmerston styled it the Ashburton Capitulation—deprived Canada of the Aroostook District, brought the northern boundary of the State of Maine to within a few miles of the St. Lawrence, and, when the time came for building the Intercolonial Railway, necessitated a circuitous route to Halifax and St. John. At first the

Canadian Parliament was disposed to establish Government ownership of railways, owing to the difficulty of enlisting private capital; but British money was found for the construction of the Grand Trunk, and Government ownership remained in abeyance for a time.

The history of the Grand Trunk Railway is well known in England and Canada. The original prospectus, issued in 1853, promised a return of $11\frac{1}{2}$ per cent. per annum on the share capital, besides the stated interest on the bonds. Canada and Canadians were blamed for the misfortunes of the road, but some of these were unavoidable. There was a board in England and another in Canada, but as the actual control was exercised from London, 3,000 miles away, it is not surprising that there was a good deal of waste in construction. The cost of bringing in materials for a pioneer road was excessive in those days, and the Canadian Government did not grant as much financial assistance to the enterprise as had been expected. Before the line was completed the panic of 1857 occurred. Wheat, which during the Crimean War of 1854-56 had realised \$2.50 per bushel at Toronto, dropped to half that figure, and there was a tremendous collapse in land values. Immigration fell off and remained at a low ebb for a long time, the Western and North-Western States, with their free prairie homesteads, being more attractive, even to the native Canadian, than the bush lands of Canada. The original line of the Grand Trunk was fairly well constructed, but the small, wood-burning locomotives and light iron rails were badly fitted for the Canadian winter. Subsequently the Canadian Board became involved in politics. In 1862 the General Manager stated in a letter to the Government that the cost of the original line had been £12,000,000 sterling, of which the Canadian Government had subscribed over £3,000,000. He added, however, that the company had afterwards been forced by political

pressure to spend probably more than £3,000,000 "in constructing parts of the system, which, though of benefit to Canada, are, commercially, entirely worthless and only drags upon the paying portions of the railway." Parliament blundered in fixing upon a gauge of 5 feet 6 inches, when most of the United States roads had a gauge of 4 feet 8½ inches. As a consequence of this through traffic had to be transferred from one car to another at the international frontier. This was a painful chapter of railway history, and, in consequence, Canadian credit suffered in England for years. Portland in Maine was selected as the winter terminus, simply because there was no access by rail to the Canadian ports of St. John and Halifax, and, by the Ashburton Award the short all-British route to them had been lost. It may be added that it was the Ashburton Award which, years afterwards, obliged the Canadian Pacific to cut across Maine on its journey to St. John rather than follow the longer route on British soil; and it is owing to the Ashburton Award that the Grand Trunk Pacific is unable to reduce the distance between Quebec and Moncton, as traversed by the Intercolonial, by more than 30 miles. If, as a recent English writer puts it, "both the Canadian Pacific and the Grand Trunk proper desert the British flag shortly after leaving Montreal for the Atlantic seaboard in winter," it is only fair to indicate on whose shoulders the responsibility really lies.

The east-and-west direction of Canadian lines is imposed on them by the configuration of the country, and, in some measure, it may be suspected, by the American tariff, which taxes all Canadian products bound south save those going in bond. The Grand Trunk was carried east and west that it might serve the settled districts in the St. Lawrence Valley, and connect Chicago and the Western States with Montreal and Portland. The Intercolonial joins the cities on the St.

Lawrence to the ports of the Maritime Provinces, and hence could not run otherwise than east and west, whilst the Canadian Pacific was built as a national work expressly to connect the newer Provinces in the West with the older ones in the East. At the present time United States roads are running spurs from south to north into the Canadian North-West and British Columbia for the purpose of diverting traffic to United States ports, but so far they have not accomplished much. In his famous report of 1839, Lord Durham recommended the establishment of the bonding privilege between Canada and the United States, which was brought about some years later. Railway traffic in both countries is left free to follow the most economical route. Goods for Canadian use reach Canada from Europe by New York or Boston; a portion of the surplus grain and package freight of the Western States is shipped to Europe by way of Montreal; the Canadian Pacific takes products of the Pacific States to the Atlantic or to New England, and, contrariwise, carries New England wares to the Pacific States; while American railways handle shipments from Eastern to Western Canada. All this intercommunication goes on without interference from the Customs officers on either side of the boundary, who merely see that the bonded cars are properly sealed. When this arrangement—excellent for both countries—grew up about 1855, it was predicted that henceforth Canadian roads would all run from north to south in order to meet the American roads at the boundary, but the prophecy was not fulfilled. At that time there was reciprocity of trade with the United States to the extent of a free interchange of natural products. The treaty was abrogated by Congress in 1866, and Canada forthwith set about building up trade with the United Kingdom through the use of Canadian railways and Canadian ports, which involved the carrying of Canadian produce

from west to east and of British goods from east to west. The heavy American tariff on Canadian productions has fired us with the ambition to be commercially as well as politically independent of the United States, and has contributed as much as any other single agency to our recent closer union with Britain.

After the Grand Trunk came the Intercolonial, which, viewed as an experiment in Government ownership and operation, has been disappointing. True, the road is handicapped by its roundabout route and by being exposed to water competition at almost every point. Its rates in general are low, its special rates on Nova Scotia iron and steel bound west being probably less than cost of haul; while the bulk of its local traffic consists of coal, lumber and other rough commodities in the transportation of which there is little profit. The capital account now stands at \$87,500,000, and no interest has ever been paid upon it. The system is 1,450 miles long. The Government has also 267 miles of road in Prince Edward Island, making over 1,700 miles in all under its control. The Island line has never paid operating expenses; its capital account is \$8,000,000. On both roads politics play a vicious part, and the Government, in despair, is contemplating their lease to a company railway or the transfer of the management to a commission.

After the Intercolonial, the Canadian Pacific was constructed. The construction of a line from the Atlantic to the Pacific Ocean had been the dream of enthusiasts for years, but did not take bodily form till British Columbia and the North-West were admitted into Confederation. The Federal Government tried its hand at building the road, but in 1881 made a contract with the present Company, which completed the work. Instead of dwelling on the success of the Canadian Pacific Company, a word may be said on the development of the West. Burke, in one of his

speeches on the American Colonies, spoke of their export of a few thousand quarters of breadstuffs to England as the splendid act of "this child of your old age, which, with a true filial piety, with a Roman charity, has put the full breast of its youthful exuberance to the mouth of its exhausted parent." At that time the American Colonies had been settled for more than a century. This year, with an average harvest, the Canadian West, which really was not opened till the completion of the Canadian Pacific 24 years ago, will export, principally to England, not less than 15,000,000 quarters of wheat, to say nothing of other grains, and probably 150,000 head of cattle. In 1888 the City of Winnipeg received and transmitted by rail 110,000 tons of goods. In 1908 the total exceeded 2,500,000. This takes no account of the traffic in grain and other articles passing through Winnipeg *en route* to other points east and west, but relates solely to the trade and manufactures of Winnipeg itself. In 1889 the traffic on the Central division of the Canadian Pacific, which extends from Lake Superior to Swift Current, through the larger portion of the wheat-belt, was less than 350,000 tons, whereas last year it exceeded 10,000,000. Before the Canadian Pacific was built it cost six shillings, in English money, to transport a bushel of wheat from Winnipeg to Liverpool. Now it costs nine-pence, although the haul by rail, the Great Lakes and the Atlantic, is 4,500 miles long. The Canadian Pacific has over 5,000 miles of completed road in the West, and the Canadian Northern, Great Northern, and Grand Trunk Pacific about 2,000 more. In the older districts no farmer is situated more than 12 or 15 miles from a railway. Man for man, the mileage is greater than in Minnesota, Dakota, or any other portion of the United States; and rates on wheat and other commodities are as low or lower than those to and from corresponding American points.

This incomparable region is receiving 150,000 immigrants a year even in these comparatively dull times, the number from the United States, who came in 1908, exceeding 60,000. Since 1898, when the rush from the United States began in earnest, neighbours in the South have invested \$300,000,000 in lands, stores, mines, cattle-ranches, lumbering and elevators in the Provinces of Alberta and Saskatchewan. British Columbia is also becoming populated, although it must be borne in mind that its area is enormous. Its coal, gold-copper and silver-lead mines are prospering, its lumber trade has grown to formidable proportions, and its fisheries are the richest in Canada, the annual catch being now worth more than that of Nova Scotia. Fruit-growing is becoming an important industry, and, when Vancouver Island is properly settled, is likely to expand to great dimensions. The Canadian Northern Railway has a large mileage west of Lake Superior, and some day, no doubt, will reach both oceans. The Grand Trunk Pacific will soon have to be added to the list of trans-continental railroads. The Government is building the section, 1,800 miles long, between Moncton in New Brunswick, and Winnipeg, and will lease it to the Company, while the Company is constructing from Winnipeg westward to Prince Rupert on the Pacific coast. It has been recently stated in England that a controlling interest in the Canadian Pacific is held in the United States. As a matter of fact such holdings of Canadian Pacific securities are very small indeed, the bulk being owned in England, Germany and Holland.

The earliest statistics of railway operations in Canada go back to 1875, and a few figures may be given to show the progress made since that date, premising that the mileage increased from 5,000 in 1876 to 21,000 in 1906. In 1908 it was 23,000:—

	1876.	1906.
Train mileage (miles)	18,000,000	73,000,000
Passengers	5,500,000	28,000,000
Freight (tons)	6,300,000	58,000,000
Gross Earnings	\$19,000,000	\$125,000,000
Net Earnings	\$3,500,000	\$38,000,000

It will be agreed, that is a very satisfactory advance in the space of 30 years. The progress made by the railways from 1900 to 1906 was so remarkable as to lead one of our public men to declare that if the Nineteenth Century belonged to the United States, the Twentieth belongs to Canada. The aggregate capital cost of Canadian railways down to 1908, counting the subsidies granted by the Federal, Provincial and Municipal authorities, and the expenditure on Government railroads, has been \$1,600,000,000 ; and, in addition, land grants have been voted to the total amount of 50,000,000 acres. So far the railways, as a whole, have not yielded any large return to the investor. The net earnings in 1908 were only sufficient to pay a dividend of 3.20 per cent on the stock and bond issues of the company roads. The lines built and operated by the Government yielded nothing. A better condition of things may be looked for as population increases and the extensive natural resources are turned to account.

Synchronising with the developement of the railroads, it became necessary to deepen the St. Lawrence between Quebec and Montreal. This work has occupied 60 years. The depth of water at the shallowest part was, in the earlier days of navigation, 11 feet. Ocean vessels bound for Montreal had to be "lightered" at Quebec, while those outward-bound from Montreal loaded only a portion of their cargo, the remainder being taken to Quebec in tow-barges. A uniform depth of 30 feet has now been obtained throughout the 170

miles of river, and the channel has been widened. The cost of this undertaking has been about \$10,000,000, and the quantity of material removed by the dredges amounts to 45,000,000 cubic yards. The result is that Montreal, which is 1,000 miles from the open Atlantic, 250 from salt water and 80 above the nearest tidal influence, has been transformed into a port capable of accommodating all but the very largest ocean vessels. We are vain enough to think that this work is in a measure comparable to the deepening of the Clyde from Greenock to Glasgow. The Allan Company began carrying the mails between England and Canada in 1856, and in the intervening half-century has rendered splendid service. The Imperial Government has paid a postal subsidy to the Cunard Line almost uninterruptedly since 1840, but has paid nothing to the Allans or to any other Canadian steamship line operating on the Atlantic, beyond the mere sea postage collected on mail matter going from England to Canada. Long ago the Canadian Government felt some jealousy that Britain should help the Cunard Line whose vessels sail to New York, rather than the Allans, who were doing so much for the St. Lawrence trade. This seeming neglect may, however, have been a blessing in disguise. At any rate, thrown upon our own resources, we have succeeded in dissipating the bad name of the St. Lawrence route among navigators and insurance men, and in making Montreal one of the chief ports of North America. Its ocean-going tonnage, in and out, in 1908 was 4,000,000 ton. The Canadian Pacific "Empresses" and the Allan turbine steamers, which now carry the mails, are among the finest vessels afloat. The contrast between them and the tiny, high-pooed barks of Jacques Cartier's day sums up the progress of ship-building in the last 300 years. Ocean freight rates from Montreal are as low as those from New York and Boston. Steamers conveying perishable articles are

furnished with an admirable system of cold storage, which is under Government supervision, while the moderate temperature of the northern route, in summer, attracts shipments of meats from United States. The ocean traffic from St. John is growing rapidly, and Quebec, though for the present eclipsed by Montreal, will some day become the great port of the St. Lawrence. Since 1867, when Confederation took place, the total tonnage of sea-going shipping entered and cleared at Canadian ports, has risen from 4,000,000 to 17,000,000 tons register.

The Imperialist who wishes to traverse the Empire can now travel continuously under the British flag. The Canadian Pacific and Allan steamships will convey him from England to Halifax, St. John, Quebec or Montreal, whence he may journey across the continent by a Canadian Pacific express train to Vancouver. Here he finds "All-Red" steamers sailing to Japan and Hong-Kong, whence he may proceed in other "All-Red" vessels to India or South Africa, or may travel back to England through the Suez Canal.

In conclusion, it is manifest that Canada has made up her mind to be true to herself and yet to remain affectionately attached to Britain. An American poet tells of the little flower which guided the hunter on the plains:—

"See how its leaves all point to the north, as true
as the magnet—

"It is the compass flower, that the finger of God
has suspended

"Here on its fragile stalk, to direct the traveller's
journey

"Over the sea-like, pathless, limitless waste of the
desert."

And an English writer, commenting on these lines, has expressed himself in terms with which, I am sure, the great majority of the people of Canada agree:—"So it must be with all Canadians. Their hearts, differ as men may on political or social or religious questions, are true to their North-Land—a land of great rivers and inland seas, of illimitable prairies and lofty mountains, of rich sea-pastures and luxuriant wheatfields—a land of free government and free speech—a goodly heritage with which they can never part to a foreign Power."



Scarth Street, Regina

SOME OF THE CHIEF POINTS TO BE VISITED ON THE WESTERN EXCURSION

REGINA

REGINA is the capital of the Province of Saskatchewan, and is situated on the main line of the Canadian Pacific Railway, three hundred and fifty miles west of Winnipeg. As capital of the province it is the seat of government. Here the Legislative Assembly meets, and all the Departmental and Executive Offices are situated. In Regina also are the headquarters of the Royal North-West Mounted Police, and the seat of the Supreme Court of the province.

Regina is the centre of the most famous wheat growing district of Saskatchewan. The country in all directions is level prairie, with the exception of a district some nine or ten miles away in a north-easterly direction where the land is somewhat rolling and there is a growth of small poplar trees.

In 1908, the total yield of all grains in crop districts 1, 2, 4 and 5, an area 264 miles square, of which Regina is practically the centre, was 93,134,482 bushels, and the total acreage under cultivation 5,250,857 acres. From the other five districts which comprise the rest of the province, each district being of an equal area, the total yield of all grains was 12,859,932 bushels, and the total acreage under cultivation 721,444 acres.

Regina, itself on the main line of the Canadian Pacific Railway, is also the terminus of the same Company's line from Arcola, which is continued through to Brandon, a line tapping a very rich and well-settled country to the south-east. The Canadian Pacific Railway has also

under course of construction a line running in a northerly direction from Regina to connect with their Pheasant Hills' line at a point at or near Bulyea. It is expected that this will be completed early in the present season. This gives easy access to Last Mountain Lake, a beautiful sheet of water some sixty miles long, the foot of which is distant only twenty-five miles from the city ; this will undoubtedly become a very popular summer resort for the citizens of Regina.

Regina is the southern terminus of the Canadian Pacific Northern Railway Company's line from Prince Albert, and is also the terminus of the same Company's line from Brandon. When continued through to the Great Lakes, this will give Regina the benefit of a competitive road through to the head of navigation.

The Grand Trunk Pacific Branch Lines' Company hold a charter for a line running from Regina to Melville, a divisional point on the main line of their great transcontinental railroad, about ninety miles north-east of Regina. This line will be continued to Yorkton, and is one of those for the construction of which the bonds of the Company were guaranteed by the Provincial Government at the last session. It is hoped that it will be completed this year. As soon as this line is completed, work will be commenced on the same Company's line in a south-easterly direction, for which the charter reads: "In a south-easterly direction from Regina to a point on the International Boundary at or near North Portal." Charters for many other lines are held by various Companies. Regina will almost certainly become the great distributing centre of the middle West.

The citizens of Regina have always been firm believers in the principle of municipal ownership, and the city owns and controls the electric light plant and the water works system. The electric light plant not only

gives an excellent service at a very low rate, (nine cents per thousand k.w. hours for light) but also yields a fair profit, which goes to reduce the rate of taxation. The water supply is derived from springs at Boggy Creek, a distance of about eight miles from the city, where a dam and reservoir have been constructed with a capacity of over 700,000,000 gallons and a fall of 85 feet from the reservoir to the power house basin. In laying the pipe line from the reservoir to the city, numerous springs were struck, and these have supplied the city without the necessity of drawing upon the reservoir. The water is well adapted for domestic purposes for use in steam boilers and other industrial purposes.

The city hall built at a cost of \$175,000, is one of the handsomest buildings in the city. It contains offices for the Civic Officials, a large auditorium capable of seating a thousand people, a public library and a handsome and well furnished council chamber.

The city has reserved large areas for park purposes. The Victoria Park in the centre of the city, contains about seven acres; Wascana Park, situated on the banks of the Lake and facing the Parliament Buildings, contains about forty-five acres and has been tastefully laid out.

The educational requirements of the city are well served by the five public schools, the "separate school," and the collegiate institute. All these have been recently erected.

Among the churches may be specially mentioned, the Metropolitan Methodist Church, the Knox Church, St. Paul's (Anglican) and St. Mary's (Roman Catholic). There are many handsome business blocks, and perhaps the finest building in the city, is the new Post Office.

CALGARY

At a point on the main line of The Canadian Pacific Railway, 642 miles east of Vancouver, on the Pacific Coast, and 840 miles west of Winnipeg, the City of Calgary is picturesquely situated in the valley of the Bow River, at the confluence of the Bow and Elbow. To the west, the snowy peaks of the Rocky Mountains are clearly visible. To the north, the country is of a rolling nature, and is well adapted for diversified farming. Southward to the International Boundary, much grain is grown, although there are many large stock farms throughout this district. To the east of Calgary, for a distance of 180 miles, the Canadian Pacific Railway Company have undertaken the greatest irrigation scheme in the world. It serves a district extending over 3,000,000 acres.

The situation and climatic conditions of Calgary are delightful. Attention may be called to its altitude of 3,389 feet, its large proportion of sunny days, and to the warm winds from the west and south-west, known as Chinook winds. The comparative mildness of the winter is in marked contrast to the cold of the more central regions of Canada. The following table shows the average temperature and rainfall, for the ten years prior to 1908, as recorded at the Government Meteorological Station at Calgary

Average Temperature, ° Farenheit.		Average Rainfall, Inches.	Average Temperature, ° Farenheit.		Average Rainfall, Inches.
January	17.5	.25	July	60.1	2.56
February	14.7	.38	August	57.0	3.70
March	21.9	.92	September	49.1	1.56
April	39.1	.55	October	41.9	.44
May	47.6	3.44	November	28.8	.59
June	58.7	4.59	December	23.2	.38



Eighth Avenue, Calgary



The large business blocks and public buildings are built of the famous Calgary sandstone, which is found along the banks of the river. There are about a dozen quarries within the city limits. The following buildings are under construction or have been completed within the past twelve months.

Public Library	\$ 50,000.00
Two Wholesale Buildings	65,000.00
High School	85,000.00
Y.M.C.A.	95,000.00
Land Titles Office	120,000.00
Board of Trade Building	130,000.00
Post Office	145,000.00
City Hall	150,000.00
General Hospital	150,000.00
Normal School	150,000.00
Court House	220,000.00
Can. Pac. Ry. Depot	225,000.00
	<hr/>
	\$1,585,000.00

There are more than nine Public Schools, a High School and a Normal School, a "Separate School," a Convent, the Western Canada College for boys, and St. Hilda's College for girls. During 1908, there were 3,566 pupils in the Calgary Schools. These pupils represent eighteen nationalities and speak fourteen different languages.

The twenty-five churches in Calgary represent the following denominations: Methodist, Presbyterian, Baptist, Episcopalian, Roman Catholic, Moravian, Lutheran, Salvation Army.

The numerous Commercial, Industrial and Financial Institutions established in Calgary, place it in the position of the Commercial Metropolis of the "Last Great

West." The Bank Clearings for the last six months of the year 1908, were \$38,526,454.00, an increase of \$3,284,363.00 over the last six months of 1907. The clearings for the last week of February, 1909, show an increase of 81.5 per cent,. The Customs receipts for 1908, were \$426,425.00.

Three daily papers, four weeklies and three monthlies, are published in Calgary.

Calgary was founded in 1882, and incorporated as a city two years later. The population in 1901, was 6,557; to-day it is more than 25,000. The city water supply is of the best, and is brought from the Rockies via the Bow River. Steam coal may be obtained in Calgary, at \$2.75 per ton upwards, natural gas has been discovered and negotiations are in progress for the development of water power on the Bow River. Calgary's railway facilities are excellent and a rapid growth and a prosperous future for the city are well assured.

BANFF*

Banff is situated at an altitude of 4,521 feet, and is the station for the Canadian National Park and Hot Springs. This park is a National Reservation of 5,732 square miles, embracing parts of the valleys of the Bow, Spray and Cascade Rivers, Lake Minnewanka and several noble mountain ranges, and beyond the "Divide," the Yoho valley and the country to the west and south of it. The park is the largest in the world, being nearly half as large again as the famous Yellowstone Park in the United States. No part of the Rockies exhibits a greater variety of sublime and pleasing scenery, and nowhere are good points of view and features of special interest so accessible, since many good roads and bridle-paths have

*The notes on Banff are taken, by permission, from the Annotated Time Table of the Canadian Pacific Railway Company.



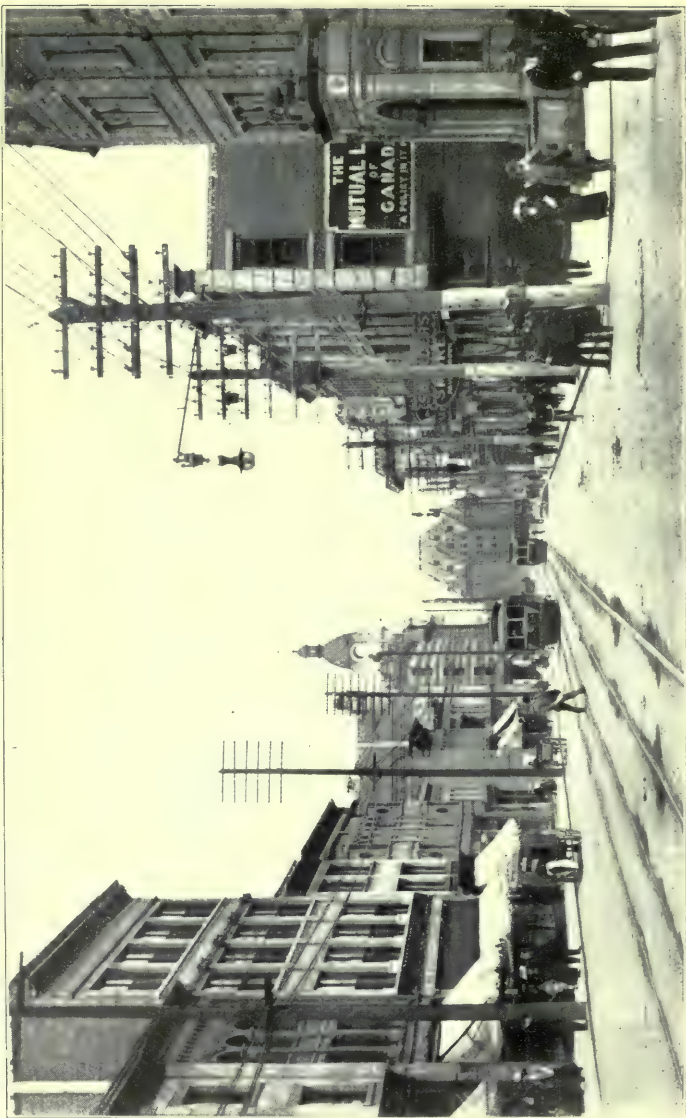
The Bow River Banff



been made. The railway station at Banff is in the midst of impressive mountains. The huge mass northward is Cascade Mountain (9,825 ft.); eastward is Mount Inglismaldie, and the heights of the Fairholme subrange, behind which lies Lake Minnewanka. South-eastward from Inglismaldie, in the same range of the Fairholmes, the sharp cone of Peechee (called after an Indian chief), closes the view in that direction; this is one of the highest mountains visible. To the left of Cascade Mountain, and just north of the track, rises the wooded ridge of Stoney Squaw Mountain, beneath which lie the Vermilion lakes, seen just after leaving the station. Up the Bow, westward, tower the distant, snowy, central heights of the Main range about Simpson's Pass, most prominently the square, wall-like crest of Mount Bourgeau. A little nearer, at the left, is seen the northern end of the Bourgeau range, and still nearer, the razor-like back of Sulphur Mountain, along the side of which are the Hot Springs, and on whose summit, at 8,030 ft., an observatory has been established. The isolated bluff southward is Tunnel Mountain, while just behind the station, Rundle Peak, 9,665 ft., rises sharply so near at hand as to cut off all the view in that direction. Just before reaching the station, the train passes along a large corral of 800 acres in which are a number of buffalo, the last specimens of the monarchs of the plains. Plans are now arranged by means of which a collection of bears will be placed in a corral in some central location in the park. The village of Banff is a short distance southwest of the station, on the hither side of the Bow, and the Canadian Pacific Railway Banff Hotel is about a mile further on. A steel bridge takes the carriage-road across to the magnificent hotel, built by the Railway Company, on an eminence between the foaming falls in the Bow and the mouth of the rapid Spray River. This hotel, which has every modern convenience and

luxury, including baths supplied from the hot sulphur springs, is kept open from May to October, and thither people from all lands flock in numbers. It is most favorably placed for health, picturesque views, and as a centre for canoeing, driving, walking or mountain-climbing. There are also a sanitarium and hospital in the village, and a museum of more than local interest has been established by the Government. Eight miles from Banff, is Lake Minnewanka, on which a fine launch has been placed. There is capital fishing, the trout being of extraordinary size. Wild sheep (the big-horn) and mountain goats are occasionally to be seen on the neighboring heights. Some extraordinary fossil remains and markings of mammoth pre-historic creatures are found on the mountain slopes surrounding this lake, as well as on Cascade Mountain. At the upper end of the lake is the valley of Ghost River, a strange region where the mountain rivulets gurggle off into subterranean reservoirs and the granite walls are pitted with caves. Between Banff and the lake is Bankhead, where are located the anthracite mines, operated by the Canadian Pacific Railway, whose output will shortly provide the country as far east as Winnipeg with fuel. The hot springs are at different elevations upon the eastern slope of Sulphur Mountain, the highest being 900 ft. above the Bow. All are reached by fine roads, commanding glorious landscapes. The more important springs have been improved by the Government, and picturesque bathing houses have been erected and placed under the care of attendants. In one locality is a pool inside a dome-roofed cave, entered by an artificial tunnel; and adjacent, another spring forms an open basin of warm sulphurous water. Since the opening of the railway, these springs have been largely visited, and testimony to their wonderful curative properties is plentiful. Twenty miles south of Banff is Mount Assiniboine, the





Granville Street - Vancouver

Matterhorn of the new world, the ascent of which, after several unsuccessful attempts, was made in the autumn of 1901, by the Rev. James Outram and a party of Swiss guides. The way to it leads through beautiful valleys studded with transparent blue lakes and park-like prairie openings.

VANCOUVER, BRITISH COLUMBIA

Vancouver, the chief commercial capital of the western half of the Canadian-American continent, is situated on the extreme western shore of the mainland of British Columbia, a distance of fifty miles north of the International boundary, overlooking the Gulf of Georgia, which, with Vancouver Island and the Straits of Juan de Fuca, lies between the city and the open Pacific Ocean. Vancouver was founded in 1886, and has a population of 85,000. Its commercial supremacy is based on the fact that it is the natural gateway for Canadian and British-Oriental trade and that it is the converging point of several transcontinental railway lines, as well as the port of trans-Pacific shipping. Chief among the transcontinental lines having their terminals at this point, is the Canadian Pacific Railway, with through and direct connections from Liverpool and all European ports via Montreal and St. John, and navigating its own steamships to Japan and China. The journey from Montreal to Vancouver occupies 96 hours. There is a regular steamship service to the Orient from Vancouver. The time from Vancouver to Yokohama is fourteen days; to Hong Kong 22 days, with intervening calls at Kobe, Nagasaki and Shanghai.

Next in importance is the trade with the Antipodes, carried on by the Canadian-Australian line, with a trio of ships called the Aorangi, the Moana and Makura. The sailings on this line are monthly, the time between

Vancouver and Sydney, (N.S.W.), being approximately thirty days, with calls at Honolulu, Suva and Brisbane. Both the Canadian-Pacific and the Canadian-Australian are Royal Mail S. S. lines and close connections are made with the fast through mails from Liverpool.

A "Four-Weekly-Service" between California points, Mexico, Guatemala, Salvador Honduras and Nicaragua is also maintained. The trade between these and Canadian ports is rapidly increasing in importance. Among other "freighters" calling regularly at the port of Vancouver, are those of the Ocean S.S. Co., and the China Mutual Steam Navigation Co., operating a monthly service to Liverpool via Japan, China and the Suez Canal.

The local service between Vancouver, Victoria and Seattle is triangular and three magnificent steamers are engaged in the trade. Morning and afternoon sailings are made for Victoria; the distance is 75 miles, and the time occupied, four hours. From Seattle to Vancouver 150 miles, the time taken is nine hours.

Daily communication is also maintained with Nanaimo, the centre of Vancouver Island coal mining industries. This port is forty miles distant and the journey occupies three hours. The "Coastwise" service is supplied by a flotilla of steamers operated by numerous steamship companies having their head offices in Vancouver. By means of these the whole coast line as far north as Alaska, Queen Charlotte Island and northern British Columbia coast ports is covered. Sailings are regularly scheduled and average four a week. All the Coastwise steamships of the Puget Sound service also call at Vancouver on their way to and from the North.

In addition to the freight and passenger delivery from the Canadian Pacific Railway, the Great Northern Railway operates three trains daily each way between Vancouver and Seattle, while extensive plans for ad-



Entrance to Burrard Inlet Vancouver B.C

ditional terminal facilities have been filed by this Company, and the work of grading and dock building is already under way. Other American transcontinental lines have also charters for rights-of-way to this terminal, and construction is being planned, while several new lines from the interior of British Columbia, having chartered rights to reach the coast, are hastening construction, so as to bring the whole of the vast interior of the province within a few hours travel from Vancouver. Charters were obtained at the last session of the legislature for lines to extend to the north in various directions and undertakings have been given that the work of construction will begin at once.

A single glance at the geographical position of Vancouver will show how suitable was its selection as a terminus for these numerous railways and steamship lines. Burrard Inlet, the landlocked harbour, entered through a narrow channel, wide, deep and sheltered, affords one of the best anchorages in the world, while its fourteen odd miles of water front affords facilities that for wharf and dockage are unsurpassed among the ports of the world. False Creek, a second waterway at the south of the business section of the city, needing only inconsiderable artificial development, affords another channel for docking big ships, and a shore line furnishing many miles of factory and mill front.

The business portion of the city occupies the centre of a gently elevated peninsula, which slopes northward southward and westward to salt water. The oldest and most fashionable residential section is in the West End, occupying the terraces between the business portion and Stanley Park, with its shore line at English Bay. Otherwise, the suburban residential sections are in the east and across False Creek, from which they slope southward and eastward like the terraces of a vast natural amphitheatre.

In the business section of the city the wide, well-paved and well-kept streets and the substantial character and architectural qualities of many of the business houses furnish impressive evidences of material prosperity, and of the confidence of investors in the future greatness of the city. The city is well provided with tram lines. There is also a double track inter-urban service with the city of New Westminster, twelve miles distant, which is being continued through the rich lands of the Fraser Valley to the city of Chilliwack. A further rural extension of the tram line connects with Steveston, the capital of the salmon fishing industry, at the mouth of the Fraser River.

The scenery of Stanley and English Bay forms one of the chief charms of Vancouver. Stanley Park consists of 1,000 acres of natural scenery. Situated upon a peninsula which is almost an island, the park is nine miles in circumference and within its grounds are some of the most magnificent specimens of the big trees of British Columbia. English Bay, the long stretch of water fronting on the Gulf of Georgia, affords bathing facilities unrivalled on the Pacific coast. The Gulf, gemmed with emerald islands studding its placid surface, stretches towards the north and south as far as the eye can reach, while across its hazy distance is the Olympic range of mountains with their snow-capped peaks, and on the north the Cascade range nearer at hand, with the serrated heights severely outlined against the sky.

VICTORIA, VANCOUVER ISLAND, BRITISH COLUMBIA

Victoria being the first port entered by all steamships from Australia, Japan, China and other Oriental coun-



Parliament Buildings, Victoria

tries, having large and varied commercial enterprises, and being the capital of the largest and richest of the Canadian provinces, is of more than ordinary interest to strangers, and is none the less so because it happens to be one of the most charmingly situated cities in the world. It is the Pacific terminus of the Canadian Pacific Railway system in Canada, has a population of nearly 40,000 and occupies an ideal situation at the extreme southern end of Vancouver Island, within a few hours' sail of the mainland of British Columbia and of the United States.

It is agreed that the picturesque situation of Victoria is unsurpassed. From Beacon Hill Park can be seen on one hand the rugged snow-clad Olympians, and on the other, rising proudly in the distance beyond the island-studded straits of Juan de Fuca, the lordly Mount Baker. The combination of magnificent scenery and almost perfect climate is destined to render Victoria one of the largest and richest residential cities on the continent. Victoria has excellent hotel accommodation. The Canadian Pacific Railway have, in the heart of the city, overlooking the picturesque harbour, one of the finest hotels on the continent, "The Empress."

The public schools of Victoria, which are free to everyone under 21 years of age, are up-to-date in every respect. The High School is in affiliation with the University of McGill, Montreal. Besides its public educational system, the city is the home of a large number of private colleges and academies both for boys and girls. The Parliament Building is acknowledged to be one of the handsomest and most imposing structures on the continent. It is one of the first sights to catch the visitor's eye as he enters the harbour of Victoria. It stands amid spacious and beautifully kept lawns, the vivid green of which testifies to the mildness of the

climate. In the Parliament Buildings, there are three Museums, the Agricultural, the Mining and the "Provincial Museum."

Owing to her natural advantages it seems probable that in the future Victoria will become a great manufacturing centre. There are no less than five or six ship yards in Victoria, and shipbuilding is becoming its most important industry. Many of the large steamers used in the coasting trade have been built here, as well as the hydrographic and other vessels used by the Dominion Government.

The country immediately surrounding the town is singularly beautiful, the undulating promontory upon which the city stands being covered with woods of pine and fir and a lovely wild jungle of arbutus, roses, flowering bushes of many varieties, and English broom. In the spring and summer there is an extraordinary abundance of beautiful wild flowers. Victoria has been described as "A Bit of England on the Shores of the Pacific." This expression conveys a very excellent idea of local conditions. The institutions, buildings, clubs, homes, manners and customs being essentially of English character.

EDMONTON

From the earliest days Edmonton, the capital of the Province of Alberta, was an important trading post of the Hudson's Bay Company. It was one of the chief centres and served as headquarters for the Peace River district and the upper waters of the North Saskatchewan. A trading post it remained till the early eighties when it engaged with the rest of Western Canada in a premature and transcient boom. Naturally it suffered from the collapse of this boom, but a beginning had been made for the future city and its population and prosperity increased slowly and surely till the



Exposed 28 foot Coal Seam on Bank of Saskatchewan River, near Edmonton

recent phenomenal developement of Western Canada commenced a decade ago. Edmonton by reason of its position and other advantages was able to take the fullest benefit of the progressive movement, and to-day finds itself the second city of the prairie provinces.

Built as it is on the steep banks of the North Saskatchewan and amid the bush which grows out from the river, it enjoys the best and most picturesque situation of any of the prairie cities. The river is both narrow and rapid at that point, and as a result, has bored a deep channel in the plains, leaving high banks covered with trees which give the city, from certain points, the appearance of standing on a hill and differentiates its aspect from other cities which are surrounded on every side by the level prairie. It has been laid out with care and taste. The streets are wide and well arranged, and every convenience such as electric light, street car service, telephones and water supplies have been secured for the inhabitants. The principal thoroughfare is Jasper Avenue running parallel to the river: the other chief streets branch off from it and it contains most of the banks and important business establishments. The city has twenty two hotels, fourteen banks, ten schools and twenty churches, and the visitor will be surprised at the size and excellent appearance of many of the buildings. Edmonton is the headquarters of the Provincial Government of Alberta, and the Local Legislature's presence makes it the centre of provincial Society and public business. The Land Titles Office for the whole of the vast territory of Northern Alberta is in the city and a large new Court House has just been erected.

Edmonton has always been a great fur-trading centre and to-day the Hudson's Bay Company and their great rivals, Revilion Brothers, secure a large proportion of their purchases of fur through their establishment here.

But it has ceased to be dependent on this trade alone, and is now the second largest distributing centre between the Lakes and the Rockies. It is the place from which the country storekeepers of North Alberta and the settlers, traders and construction gangs engaged in the development of an enormous area of territory derive their supplies : as a result, every wholesale house of any importance has a branch or agency and its volume of annual trade is developing in an unprecedented manner. It is also a very important railway centre; the Canadian Northern have had their western terminus there for four years and the Grand Trunk Pacific have just completed their tracks into the city. At present, the Canadian Pacific passenger trains only run to Strathcona on the north side of the river, but this Company intends, in the immediate future, to cooperate with the two cities in constructing a much needed high level bridge for railway and other traffic. At present Edmonton has 25,000 inhabitants and Strathcona about 7,000 : a friendly but keen rivalry exists between the two places, but sooner or later they are destined to be harmoniously united. Edmonton, as the capital, has the better prospects but the smaller city has recently received a handsome solatium in the shape of the Provincial University.

Edmonton is particularly fortunate in one respect: it is built on extensive coal beds of fairly good quality and at least half a score of coal mines are in operation in the immediate vicinity of the city. This is in itself an enormous advantage as it must decrease the cost of living in winter and offer great attractions to the establishment of manufactures. Again, within 20 miles of the city, are extensive marl beds, brick or pottery clay-deposits, asphalt, and, further away, deposits of iron : successful dredging operations for gold are also carried on in the river within the city precincts.

Not so long ago Edmonton was regarded as the frontier post of civilisation and settlement in the Northwest, but to-day the Canadian Northern and Grand Trunk Pacific are rapidly pushing their transcontinental lines westward, projecting new branches and planning to open up vast tracts of fertile country. Homesteaders are flocking in, villages are springing up and the wilderness is being tamed by science and labor. At Edmonton the visitor will hear little else talked of but a certain land of promise called the Peace River Valley, to which the eyes of the world are, some day, to be turned as a greater wheat-growing area than the Saskatchewan Valley. The people of Edmonton regard Manitoba and Ontario as old decadent civilisations and talk glibly of the greater prospects of the vast country to the north of their city. Their enthusiastic hopes have certain strong foundations in fact and are bound at least to be partially realized. But the future of Edmonton itself is assured though the Peace River Valley should prove to be a very barren tract which is unthinkable and the Alberta capital may yet become a serious rival of Winnipeg for the position of premier city in Western Canada. Happily there is room for two great cities in this vast land and each has a territory larger than most European countries to dominate as a political, social and commercial centre.





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